

# MOTOR AGE

Engineering  
Library

MAY 10 1940

A CHILTON PUBLICATION

DEVOTED TO THE INTERESTS OF THE INDEPENDENT SERVICE STATION



Kelly Petillo smiles at Mrs. Petillo as she adjusts his helmet at the Indianapolis Speedway where Kelly is readying his mount for the Memorial Day 500-mile race. He was winner of the 1935 race. For a peek at the "who's who" and "what's what" for this year's race read Pete De Paolo's story on page 14 of this issue.

MAY  
1940



## *Tough.. BUT OH SO GENTLE*

**TOUGH ON OIL-PUMPING • GENTLE ON CYLINDER WALLS**

It's easy to understand why Hastings Steel-Vent has become one of the largest selling piston rings ever placed on the market.

Car owners like Steel-Vent because it stops oil-pumping. You men behind the service scenes like Steel-Vent because, in addition to stopping oil-pumping, it actually reduces the

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Standardize on Hastings Steel-Vent Piston Ring Sets. They're "motor engineered" to the individual job.

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Piston Rings • Piston Expanders • Valv-Rings

# HASTINGS

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U. S. Patent Nos. 2,148,997, 2,175,409

*Stop Oil-Pumping • Check Cylinder Wear*



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*As recommended by C*

*As recommended by COLLIERS to its Readers*

Start your own  
**SAFETY  
DRIVE**  
with PREVENTIVE SERVICE

**7** HERE are three angles to safety—the car, the driver, the traffic. Here's a triangle that is only as safe as its weakest side. All too often the weak side is the condition of the car. This sixth installment on Preventive Service covers "P.S." for safety.

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### The Fertilization of Hydromedusae

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### Friction and Traction

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Moving with Confidence

In the production of steel, millmen should appreciate the importance of your trade; much the importance of your trade; profit from the fact that the experience of a person is due to a person's ability, or the lack of pick-up.

The emphasis then on the importance of your trade is to give credit to its importance; the importance of your pick-up leads to more emphasis on the importance of your trade, and the importance of your trade leads to more emphasis on the importance of your trade.

[illegible]

This long-range look is the reason, says the report, that the U.S. has been able to stay on top of its military technology. The report also says that the U.S. has been able to stay on top of its military technology because it has been able to stay on top of its military technology.

...and the ...  
...and the ...  
...and the ...

**Proper Light**

The only difference between the lighting of a house and the lighting of a theatre is that in a house the light is not controlled. In a theatre, the light is controlled by the lighting designer. The lighting designer is the person who is responsible for the lighting of a production. He or she is the person who decides what lights to use, how to use them, and when to use them. The lighting designer is the person who makes the lighting work for the production. The lighting designer is the person who makes the lighting work for the production.

Speculated by some  
for others

for Motor Sales Co.

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of the same year, 1880, to be

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All the Time

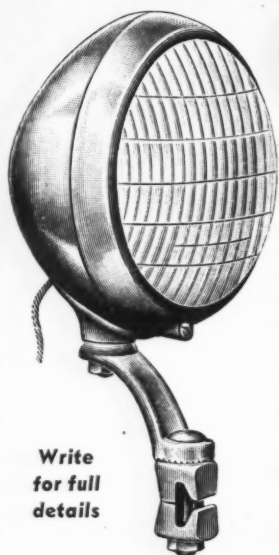
Let me tell you that the State of  
Ohio, a fact and the fact, the  
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Nothing should be considered as  
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*Preventive Service* will save you trouble on the road

More than 2 1/4 Million  
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*And Now... WE'RE SATISFIED!*  
WE RECOMMEND AS ABSOLUTELY PRACTICAL



Write  
for full  
details



**SOLAR  
DRIVING AND  
PASSING LAMPS**

### SEALED TYPE

Metal and glass construction same as used in 1940 original equipment lamps.

Tamper-proof, weatherproof optical assembly assuring lasting efficiency and accuracy without strain on generator and lighting equipment. Installed in pairs, furnished complete.

Tested — Approvals Applied for

Model No. 861 for DRIVING and PASSING with crystal lens

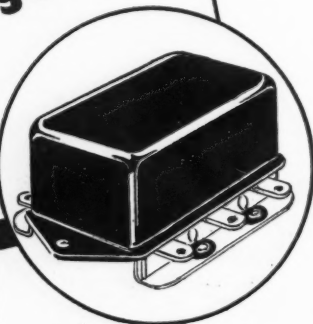
Model No. 865 for ADVERSE WEATHER with DUAL-TONE lens of crystal and amben

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For SALES  
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### A Complete and Up-To-Date Line For All Cars

NIEHOFF Voltage Regulators place you in position to broaden your service and to increase your profits by opening a new field for parts and labor sales. This unusual profit opportunity will interest every repairshop and garage operator. The complete line is made from highest quality materials and is engineered for efficient performance and long service. The contact point quality is beyond question.

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The new, NIEHOFF Regulator illustrated above is the 3-Unit vibrating type, designed to accurately control and regulate the heavy duty generators on all 1937-39 Chrysler, DeSoto, Dodge, and Plymouth models. It automatically controls the output and adjusts the charging rate with current load requirements. More than this, it prevents the generator from overcharging the battery and eliminates high voltage troubles. It is compensated for temperature changes and requires no adjustment to meet the extra load imposed by radio, heater, spotlight, and other accessories.

# MOTOR AGE

DEVOTED TO THE INTERESTS OF THE INDEPENDENT  
SERVICE STATION

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# MOTOR AGE

MAY 1940

## Help

Well, I certainly got snowed under with help from youse guys on the trouble Vierson's Garage in Maywood, Neb., was having with burning out Ford coils. Earl Farr of Chicago, Ward Brand of Smithfield, Neb., J. D. Cotton of Firebaugh, Cal., and H. P. Rouse of San Jose, Cal., to mention a few, pointed out that it was undoubtedly caused by a shorted resistance coil. They were one hundred per cent right, as Vierson himself wrote me. It seems he also got a bunch of letters direct, but fortunately located the trouble even before he received my letter.

## More Help

Also got several assists on some of the other troubles published in recent issues of Motor Age. Lyle Darby of Saranac, Mich., and George Perry of Napa, Cal., said that the uneven idle experienced by a New Brunswick subscriber was caused by a defective timing gear. That sounded pretty good to me, so I passed it along. To date I haven't heard whether that was the right answer or not.

## Still More Help

F. W. Shaw of Omaha, Neb., sent me a long letter on the trouble Rand's garage was having with a Chevrolet. It was a 1932 job which wouldn't start with the starter as long as the coil was in contact with any metal portion of the car. Shaw got right down to fundamentals and I sent a copy to Rand. Hope it helped. Incidentally, Rand, will you drop me a line and let me know how you made out?



# Shop Talk

## And Still More

You probably remember the trouble that C. E. Richardson was having with Chevie brakes. His letter was published in March and Cecil Bower of Kingston, Ohio, agrees with me that the master cylinder should be replaced but also suggested that the trouble might be caused by air entering rear wheel cylinders when the hand brake was applied. It seems that the pistons and the cups would follow the shoes when the brakes were applied mechanically. Atmospheric pressure would collapse the cups and air would enter the system. Seems possible, and Cecil backs up his statement that Chevrolet sent out a service bulletin on it a couple of years ago.

## Body Work

Many mechanics don't know any more about straightening a fender than the youngster in the illustration. But those that do and have gotten on the band wagon are making more money than their competitors who don't go in for body service. Car owners are interested in appearance. They will pay real money to the shop that will take the wrinkles out of their fenders and do the necessary painting. If you are not satisfied with the profits you are making, add a body service department.

*Bill Toboalt*

**By**  
**PETER DE PAOLO**

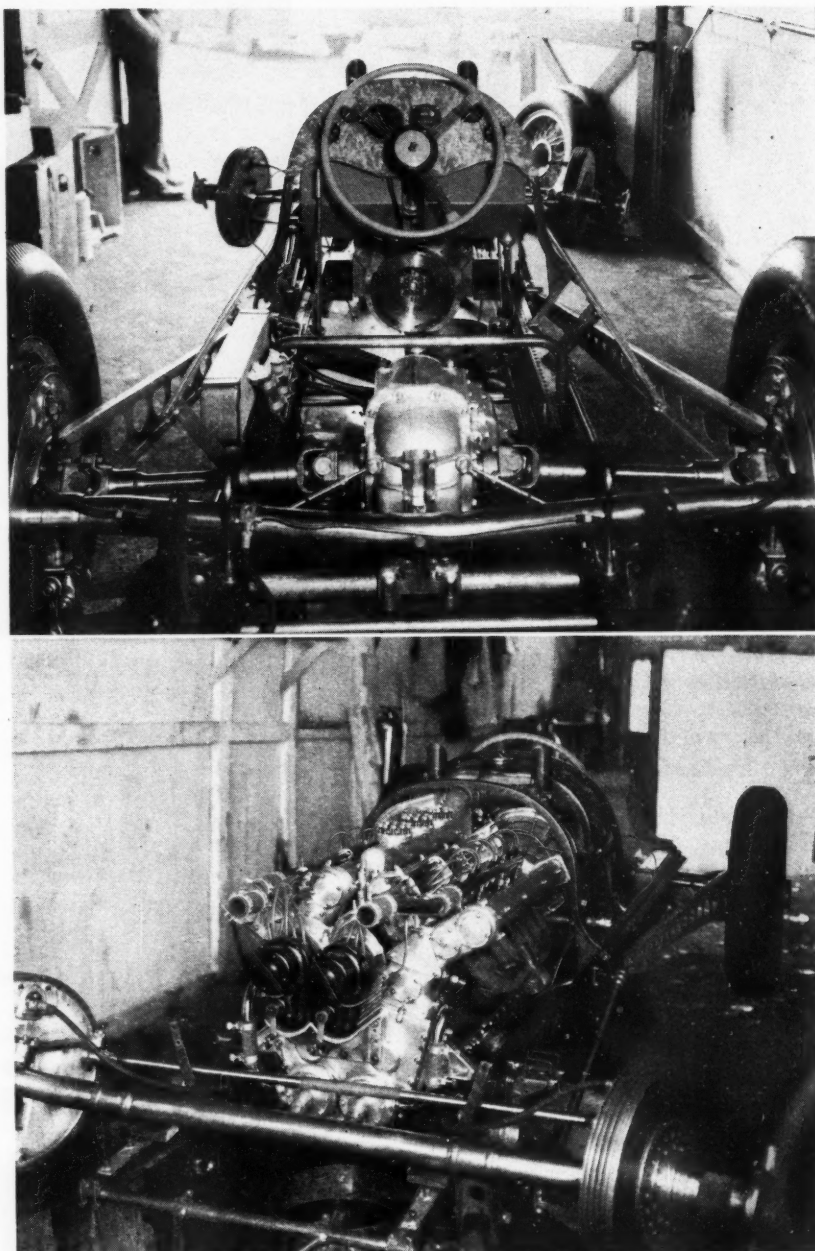
Former Indianapolis star and now  
Field Engineer for Hastings Mfg. Co.

**T**HE height of every racing driver's ambition is to win the Indianapolis 500 Mile Race! Why? Principally for two reasons, that it pays the highest cash award of any other racing event, and the fact that it is classed as an "International Event."

However, the spectators haven't witnessed any foreign competition since the 1930 race, when two Italians, Cucinotta and Borzachini, made their appearance in a pair of Italian Maserati cars. Their showing proved anything but impressive, due to inexperience on the brick oval, having to travel in the opposite direction on the track to which they are accustomed in their own native land, and because of motor failure during the race, having gone only 185 and 7 laps respectively, instead of the required 200 laps.

Negotiations for foreign competition in the forthcoming race seem quite favorable, with thanks to a couple of New York sportsmen, Richard T. Wharton and Thomas W. Dewart, who are entering an Alfa-Romeo recently owned and driven by Raymond Sommer, one of the leading French drivers. They are in hopes of having Tazio Nuvolari, winner of the first race at Roosevelt Raceway on Long Island a couple of years ago, coming over from Italy to drive the car for them at Indianapolis this year.

Three other Italian drivers have expressed a desire of making their initial bid on the Indianapolis track this year. Villoresi, Biondetti and



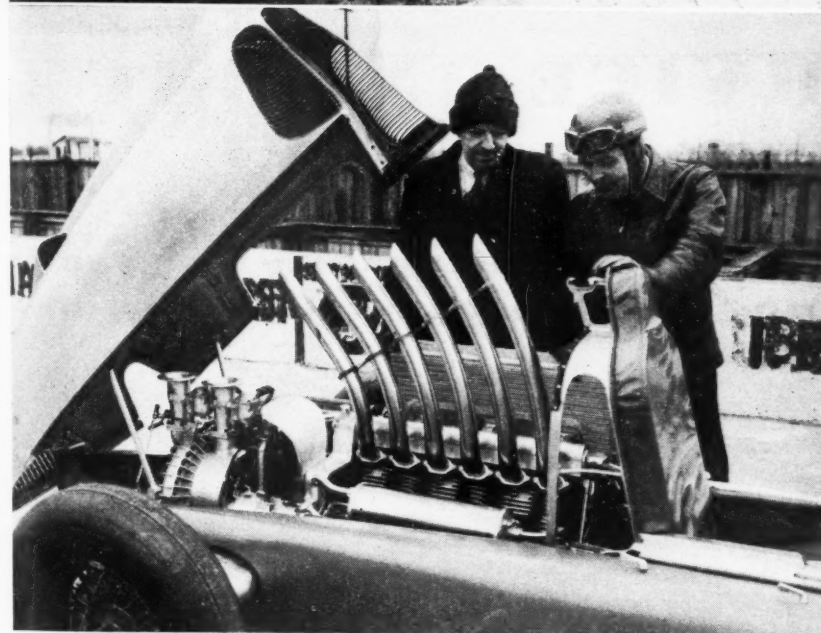
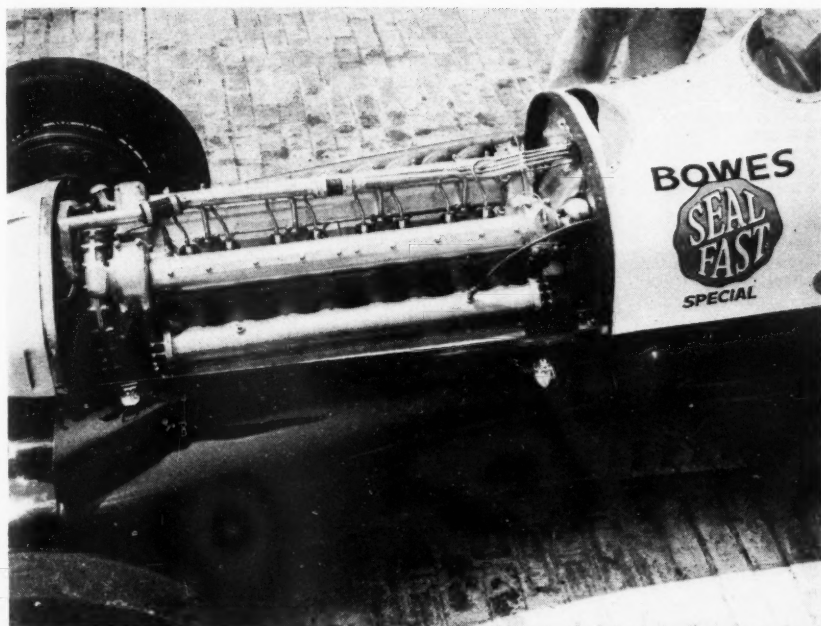
(Upper) Reilly Brett is preparing the Aldan Sampson entry. Last year it qualified at 129.431 m.p.h.

(Lower) The Aldan Sampson entry, powered with the Frank Lockhart Daytona Beach engines, will again be driven by Bob Swanson.

## TAKE A LOOK WITH

*—at what's going on behind the scenes as the*





(Upper) Louis Meyer's job with which he nearly won last year will be driven by Rex Mays.

(Lower) One of the front wheel drive jobs designed by Harry Miller which will probably be driven by George Barringer.

Pintacuda, all considered top-notch drivers in Europe.

By coming over here to compete in this year's race they would be displaying good judgment, in view of the fact that other foreign drivers, who had been making a clean sweep of all major races in Europe, are now serving their respective countries in a military capacity.

A lot of interest surrounded the Thorne Engineering camp last year shortly after the excitement of the 500-mile race had subsided, when Joel Thorne, head man of the outfit made the statement he would sell his entire stable of cars, and start building new ones. Leaning toward the smaller 3-liter (91½ cu. in.) jobs fitted with superchargers, enabling him to compete in the smaller displacement category of races in Europe. But evidently the present European war entanglement has blasted all of Joel's foreign ideas of racing sky-high.

In a report from Art Sparks, chief engineer for the Thorne Engineering Co., he mentions their entire interests will be represented by ONE entry. A 271-cu. in. non-supercharged car to be driven by the boss, Joe Thorne. The only change on this car which Joe drove last year will consist of manifolding and carburetion. The 183-cu. in. cars which were driven last year by Rex Mays and the late Jimmy Snyder, entered by Thorne, will be left at the factory in Burbank, Cal., for numerous reasons, according to Art Sparks.

Louie Meyers, the only three-time winner at Indianapolis, having definitely retired from active racing, spent the winter months out in South Gate, Cal., supervising the overhauling of the car

(Continued on page 76)

## PETE DE PAOLO

*Indianapolis Memorial Day classic nears*



Peter De Paolo

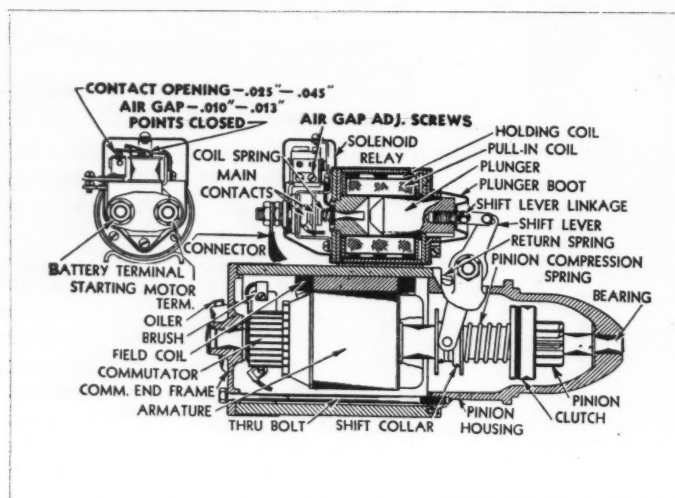


Fig. 1. Starting Motor—Series 40

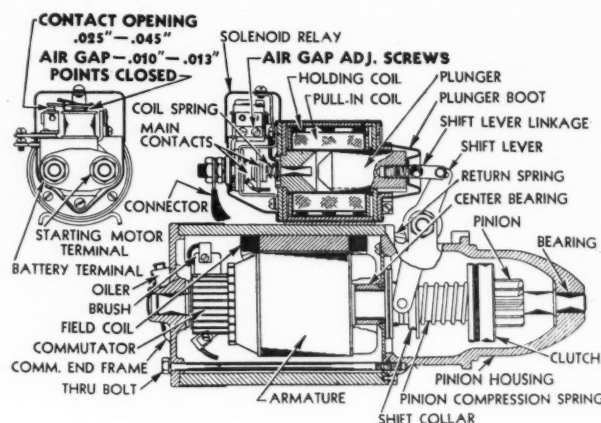


Fig. 2. Starting Motor—Series 60-80-90

# FLAT RATE SERVICE ON BUICK

A story full of information that you'll want to keep handy for a long, long time

**T**HE Buick Starter Control enables the engine to be started automatically, after the ignition has been turned on, by operating either the hand throttle control on the instrument panel or by pressing down on the accelerator pedal.

The starter circuit is opened and the gears automatically disengaged as soon as the engine starts.

The units comprising the starter control mechanism consist of the following:

1. A switch mounted on the carburetor throttle body and operated by both the engine vacuum and throttle fly shaft.
2. A solenoid, mounted on the starting motor, for operating the pinion shifting mechanism and closing the starter switch.
3. A relay, mounted on the solenoid, for operating the solenoid.
4. The generator windings are used for completing the control circuit to ground.

After the ignition has been turned on, engine can be started by pressing down on the accelerator pedal or by pulling out the throttle button. The movement of either of

the controls causes the throttle to open and the vacuum switch contacts to close. This allows the current to flow from the battery through the ignition switch, vacuum switch, solenoid relay windings and the generator to ground.

Completion of this circuit causes the solenoid relay contacts to close; current from the battery then flows through the "closing" and "hold-in" coils of the solenoid, magnetizing the solenoid plunger, which shifts the pinion into engagement with fly-wheel gear and closes the starter switch.

The closing of the starter switch causes the starter to crank the engine and also cuts out the closing coil of the solenoid, the magnetic pull of the "hold-in" coil being sufficient to hold the pinion in mesh after the shifting has been performed. This reduces the current consumed by the solenoid while the starter is operating.

Normally, as soon as the engine is running, the vacuum switch will be locked open by the manifold vacuum as throttle is returned to idle position. This causes the sole-

noid relay contacts to open, which breaks the solenoid circuit. A torsional spring on the starter shifter yoke first allows the starter switch to open and then disengages the starter gears.

Under conditions where the throttle does not return to idle position or engine vacuum is not sufficient to lock open the vacuum switch contacts, the increasing speed of the generator results in generating a voltage which prevents current passing through the magnet coil of the solenoid relay from continuing its flow through the generator to ground.

## To Test Solenoid Relay

- (a) Make sure that ignition switch is turned off.
- (b) Connect lead from one end of a 24-ohm variable rheostat to battery cable terminal on solenoid.
- (c) Connect wire from other side of rheostat to terminal on solenoid relay which is connected to the vacuum switch. This is the terminal having a white wire with black parallel tracers connected to it.

(Continued on page 56)



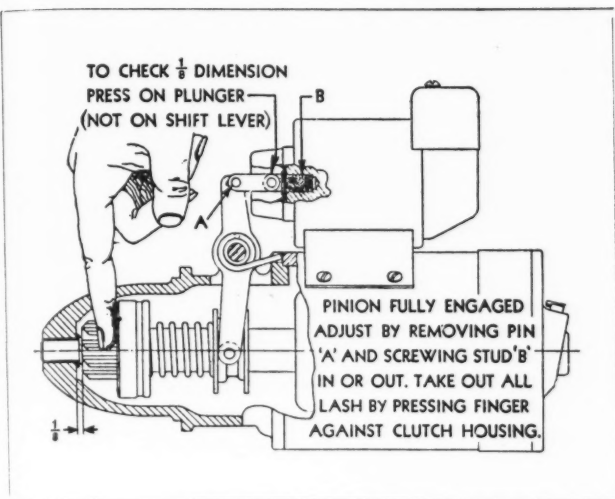
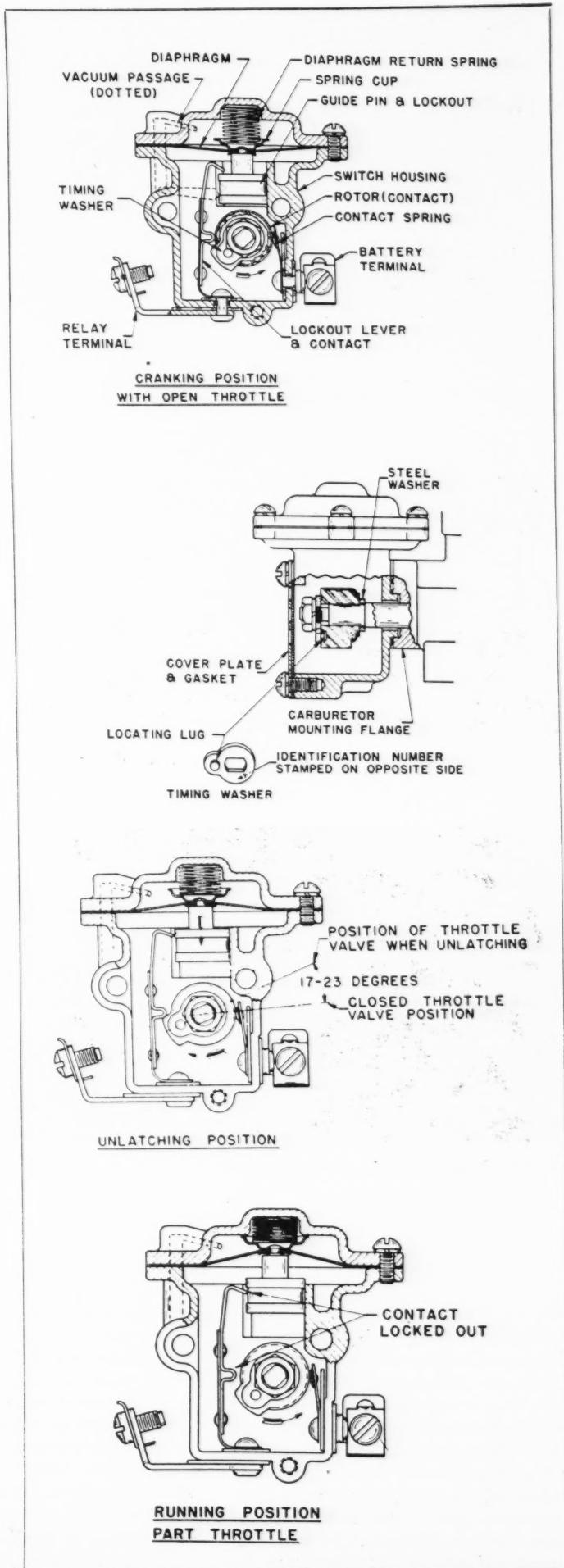
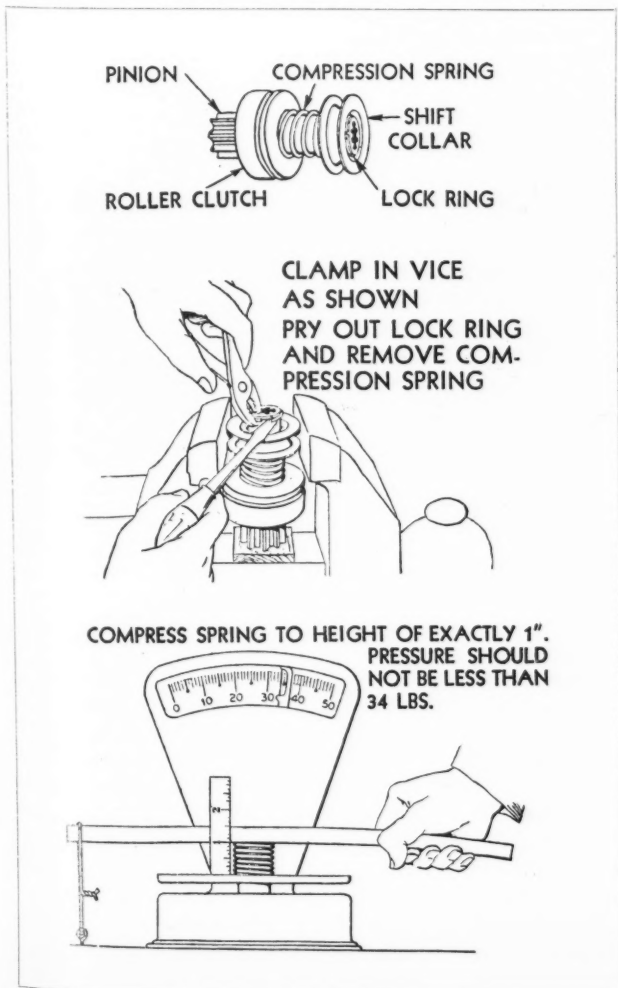
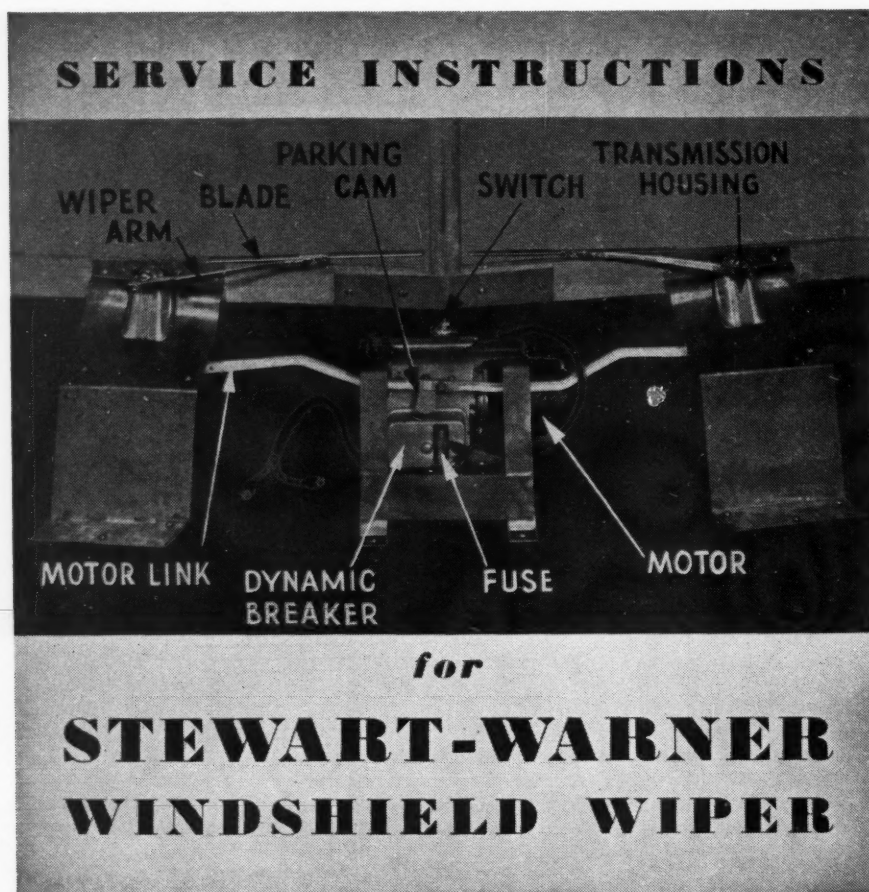


Fig. 3. Adjusting Pinion Travel

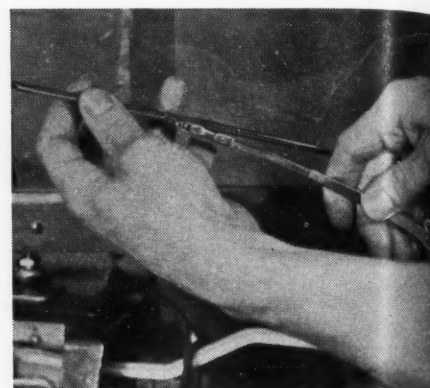
# STARTERS

Fig. 4. (Below) Checking Starter Pinion Compression Spring Pressure. Fig. 5. (Right) Starter Vacuum Switch

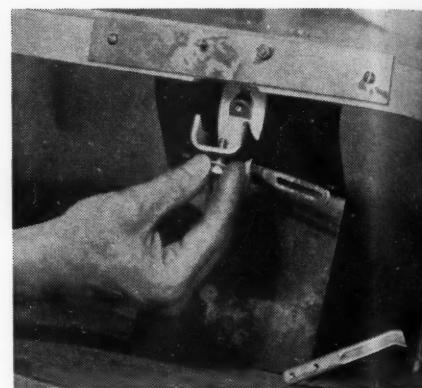




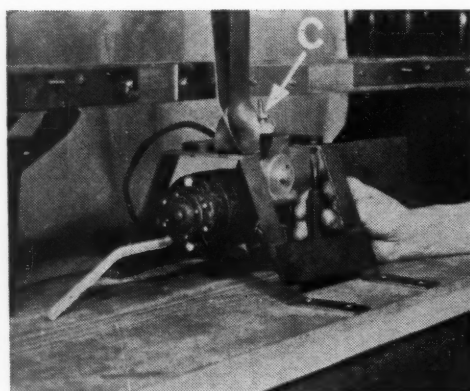
1. Complete Windshield Wiper



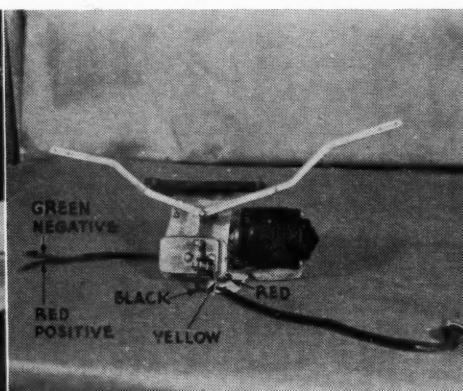
2. Removing Wiper Blade



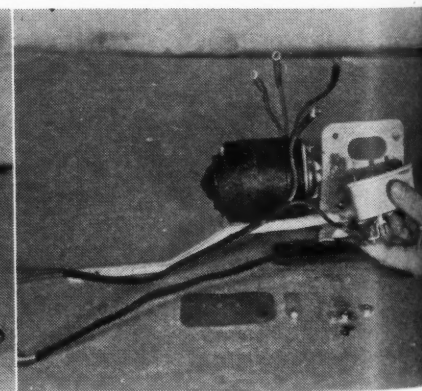
6. Remove Bolt and Bracket



10. Removing Wiper Mechanism



11. Rear View of Wiper Mechanism



12. Removing Dynamic Breaker

#### General Operation

**T**HE Stewart-Warner Windshield Wiper, Series 645, is electrically operated. When the switch knob (See Fig. 1) is turned on, the electric motor operates the two windshield wiper blades, each of which is fastened to the motor gear by means of individual transmission housings and connecting motor links. When the switch knob is turned off the motor continues to

operate until the blades are parked at the bottom of their stroke. When the blades reach this position the blade parking switch is turned off and the motor stops.

If switch is turned off and on in quick succession, the wiper arms will make about two complete strokes before parking in proper position.

#### How to Replace Blades

1. The wiper blades are removed

by holding the wiper arm away from the glass with one hand and pulling end of the blade with the other hand (See Fig. 2). Care should be used so that the spring inside the wiper arm is not stretched out of shape.

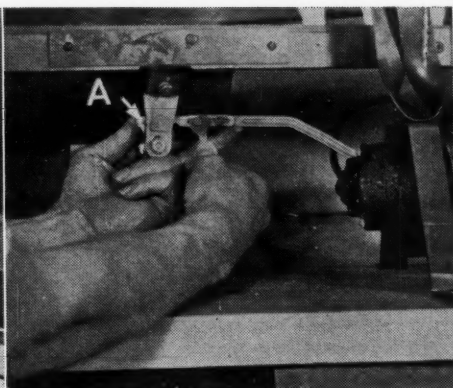
#### How to Make Blade Parking Adjustment

When not in use, the wiper blades should park near the base of the

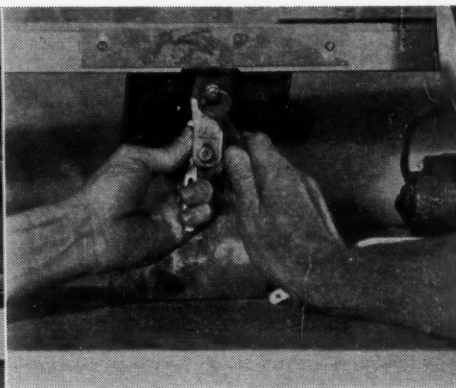




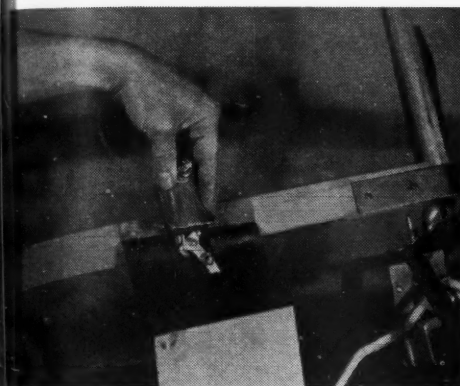
3. Removing Wiper Arm



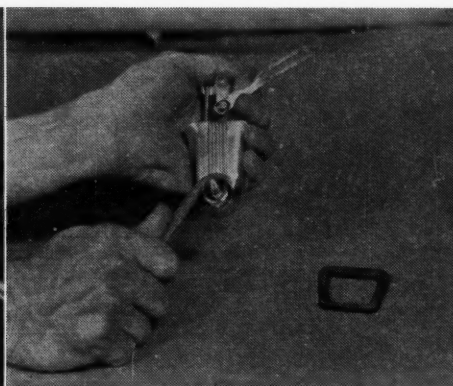
4. Locking Adjustment Screws



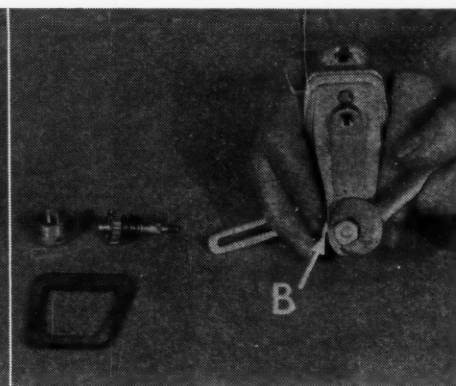
5. Loosen bolt holding Transmission Housing



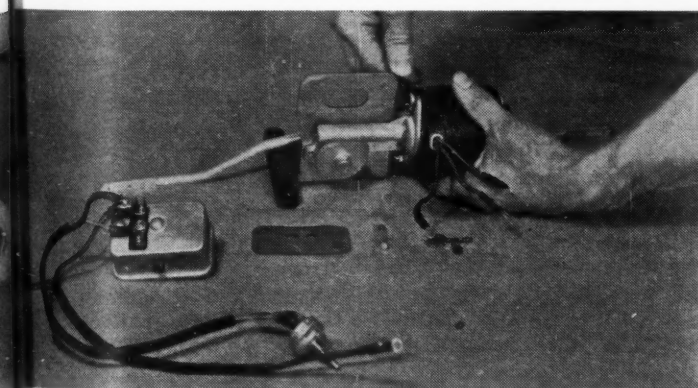
7. Removing Transmission Housing



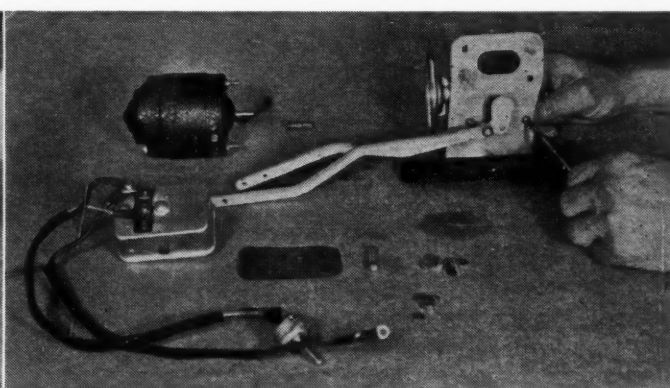
8. Removing Gear with T-124928



9. Adjusting Connectors of Housing



13. Removing Motor and Drive Spring



14. Removing Gear Box

windshield toward center where it does not conflict with clear vision. To adjust:

1. Remove wiper blade.
2. Remove wiper arm (See Fig. 3).
3. (If wiper spring requires replacement, it can be easily done at this point.)
3. Loosen adjustment screws on control arm.
4. The transmission link (See point "A," Fig. 4) should be pulled

out as far as it will go (away from motor) and then pushed back 1/16 in. before locking adjustment screws.

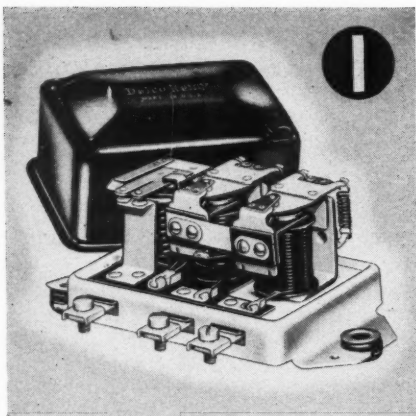
Set securely but do not pull sufficiently on wrench to break screw. All adjustments are to be made when wiper has been parked normally. Should wipers be stopped by turning off ignition they will not necessarily be parked in the correct position.

Should either wiper arm be misaligned, it can easily be returned to the correct position by returning it to the same position the other wiper is operating.

5. After the lock screws are tight, the wiper arm and wiper blade should be installed as a unit.

6. Install the arm and blade in position desired. Note in Fig. 3 how the wiper blade is held down

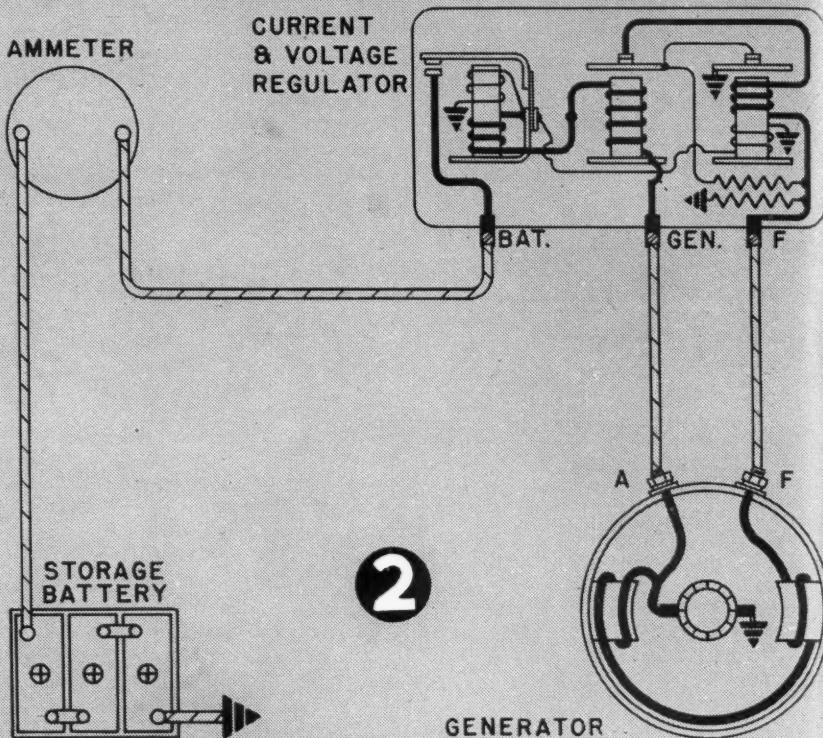
(Continued on page 60)



1. The new Delco-Remy current and voltage regulator used with the 34-ampere generator.

2. Wiring circuit of generator and regulator, a guide for connecting test instruments.

3. Assembling contact supports to the current and voltage regulator. Check insulators.



IT'S the natural impulse when somebody comes in and reports what sounds like regulator trouble, for the service man to grab a screwdriver and pliers and go to work on the regulator. But the careful mechanic has learned not to always trust first impulses—because they're liable to get him into trouble.

This is certainly true on the new Delco-Remy single core current and voltage regulator (Figure 1) used with the 34-amp. Delco-Remy shunt generator, because these units are precision built and they must be accurately set and adjusted, and the "Maybe this is the trouble" mechanic isn't going to get very far with them. We've already discussed, in the March issue, *how* the new regulator is checked and adjusted, and *how* to clean regulator points. Now, let's talk about *when* and *whether or not* to do this adjusting and point cleaning.

There are certain easy, quick checks which we can use on the generator-regulator system which will tell us whether the units are operating in a normal manner, and if not, which unit is at fault. This gets us to the heart of the trouble

## TROUBLE SHOOTING DELCO-REMY

***There's no room for guess work on these units. You must know the right way***

**By WILLIAM H. CROUSE**

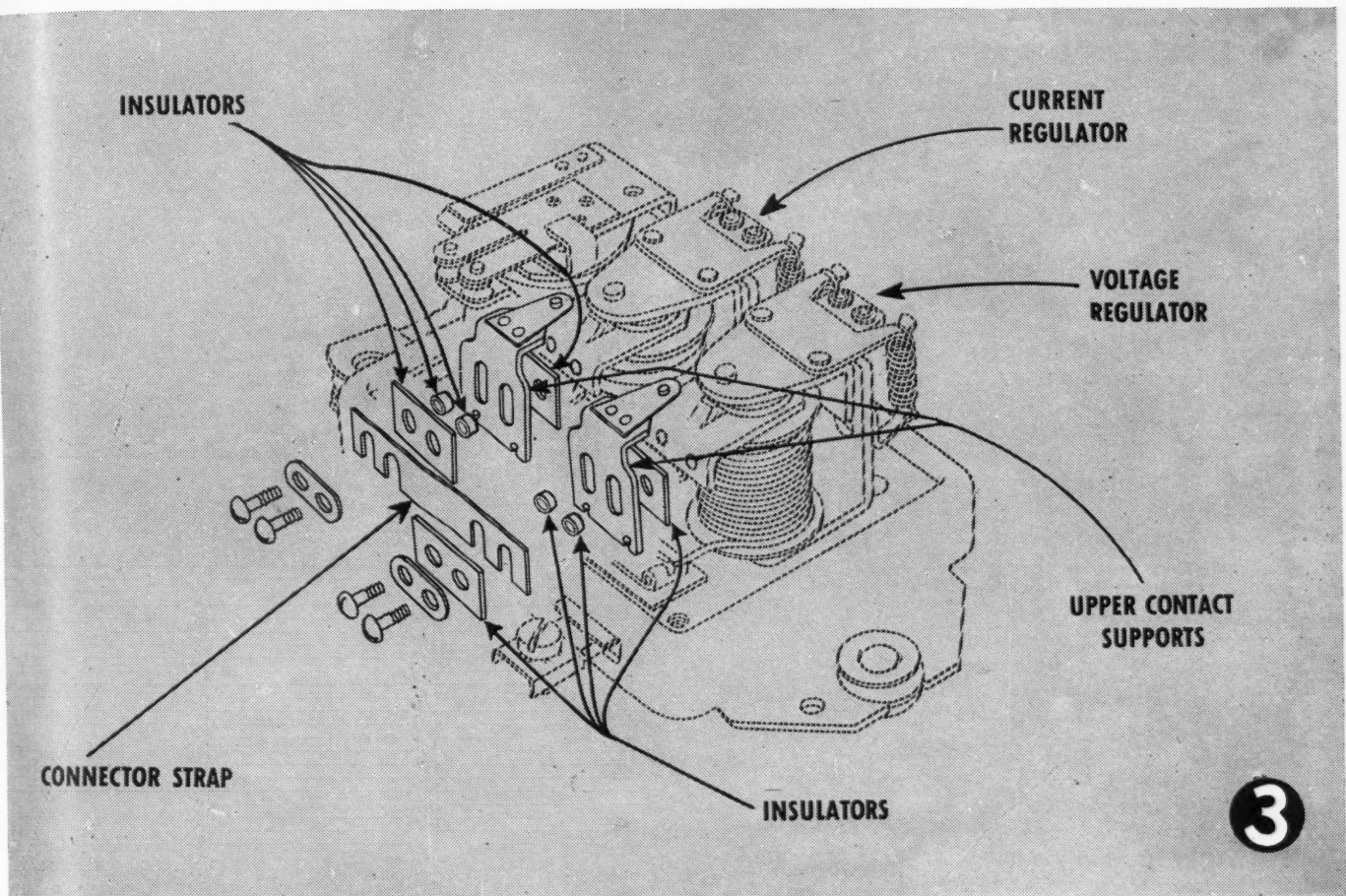
DELCO-REMY SERVICE DEPARTMENT

at once and keeps us from wasting time trying to find out what is causing the "Low Output" or the "Overcharge" or whatever it is the customer reports.

Most of these reports can be di-

vided into three categories—some but not enough output, no output at all, and too much output. Let's consider each of these in turn, find out what might cause it and how to locate and correct the cause.





## REGULATORS

(1) WITH A RUN DOWN BATTERY AND A LOW OR NO CHARGING RATE, check the battery to make sure it is really run down, and then check the wiring circuit for loose connections, frayed or damaged wires. If there are loose connections or defective wires which would produce abnormal resistance in the circuit, a normal charge will be prevented from reaching the battery. If the wiring and connections are okay, then the trouble is in either the regulator or generator. To determine which is at fault, connect a test ammeter into the circuit at the "BAT" terminal of the regulator (Figure 2), start the engine, increase the speed and note the output. Now slow the engine to idle and with a jumper lead, connect between the "F" terminal

of the regulator and ground—the regulator base is satisfactory. This eliminates all regulation, and if the generator is in good condition will allow a very high output. Therefore, be careful to increase the generator speed slowly so that if the generator is okay, the output will not go too high.

(A) If the output does increase to around 30 amp. or more, the generator is electrically okay and the regulator is preventing the generator from producing its output in a normal manner. Check for a low voltage setting on the voltage regulator unit, and for dirty or oxidized voltage and current regulator unit contact points.

(B) If the generator output remains at a few amperes with the "F" terminal grounded, the genera-

tor is at fault. Check the generator drive belt for slipping. Inspect the generator brushes for wear or sticking in their holders and measure the brush spring tension to be sure it is within the specifications. Inspect the commutator for roughness, grease, dirt in the slots, high mica, etc. If the condition causing the trouble with the generator is not readily apparent, it will be necessary to remove the generator so it can be thoroughly checked on the test bench.

(C) If the generator will not produce any output at all, even with the "F" terminal grounded, it is probably at fault, although it is possible that the generator can produce an output, but because the cut-out relay is not closing, or be-

*(Continued on page 77)*

**By**  
**ROSE LU GOLDMAN**

**Y**OU say you've got a good line of accessories in your place but they aren't moving the way they should? Well, what are you doing about them? Of course, you don't want to spend too much time on them, because . . . well, they're just a sideline to your repair business, but there are a lot of accessory prospects going in and out of your shop all the time—people who bring cars in for attention, and who might easily buy a few extras if you happened to approach them at the proper moment.

Let's talk for a while about one group of these prospects—the women who drive into your shop.

There's no getting around the fact that the women are accessory-minded. They're conscious—even to the point of being critical—of the extras that make (or mar) a costume, a room, or an automobile. At the cost of millions of merchandising dollars they have been educated to the thought that one good dress does not an outfit make, nor four walls and a table a dining room. To said room must be added chairs, pictures, a rug, and probably, most important of



## LET'S TALK ABOUT

# S.A.

all, good curtains and a few flowers and ornaments. The table may be a genuine Sheraton (*good, to you*) but without the proper accompaniments it might as well be a couple of planks laid over some saw horses.

And our lady must learn that the same principle holds true for her car. Lacking a few necessary accessories, no automobile can be truly comfortable, while an additional two or three give any car that well-groomed appearance that women treasure. Now that spring is here and the feminine mind is occupied with house-cleaning and wardrobe-renovation, it's a good time for you men to put in a word

***—which, in this case, means just selling accessories—particularly to the women***

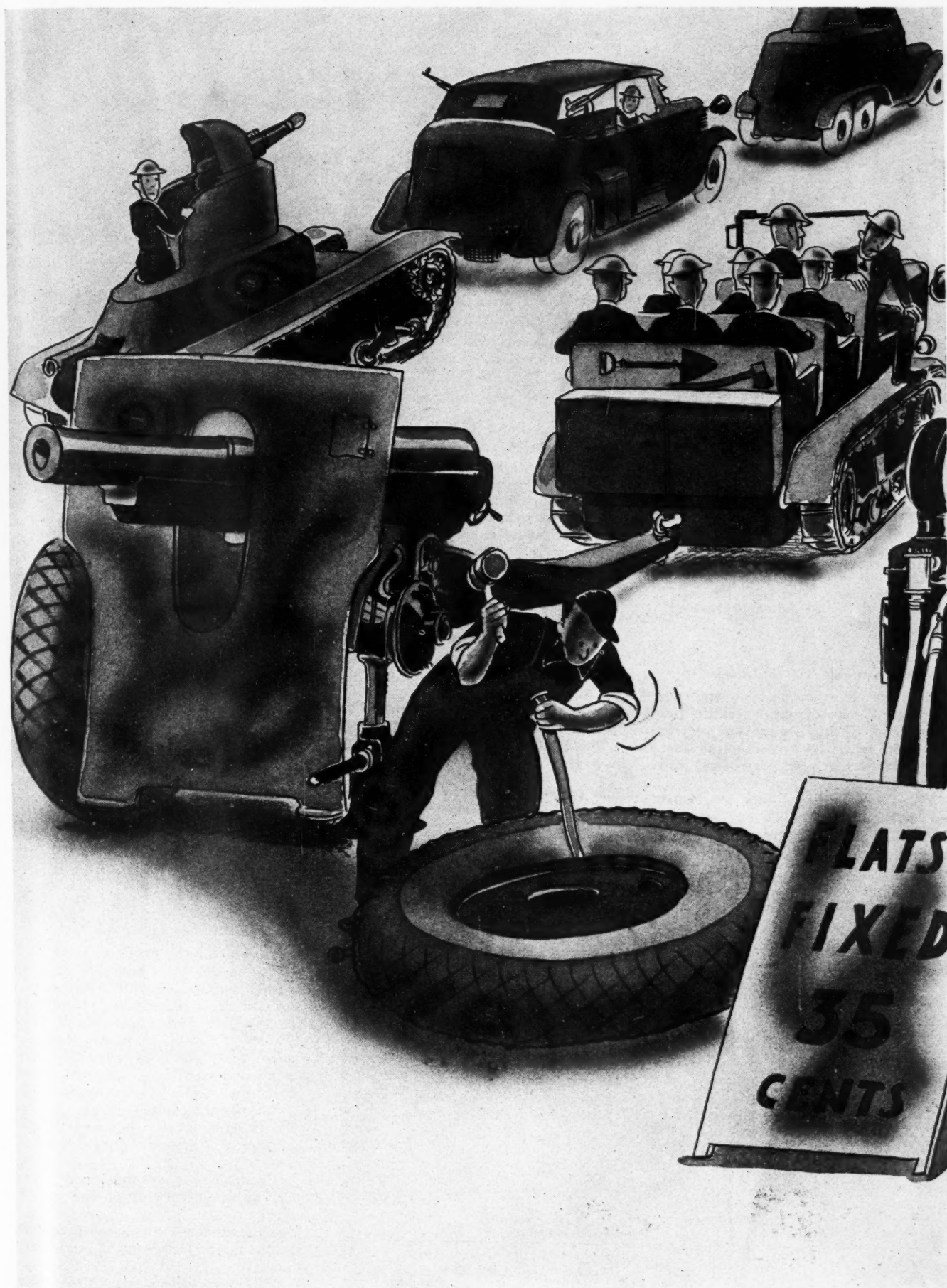
about sprucing up the car—about adding the few little extras that make for a distinctive (and comfortable) automobile.

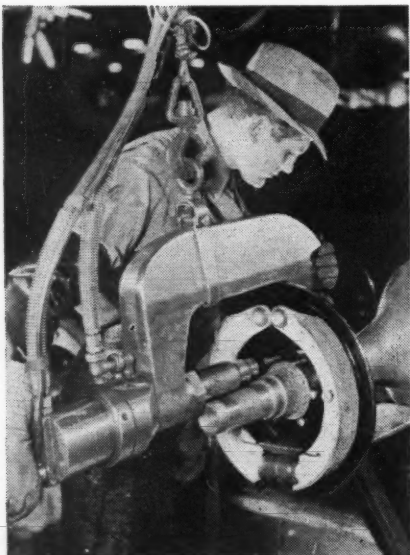
To be explicit—what car is really comfortable in winter if it doesn't have a heater? Oh, one can survive, of course, but you aren't getting from your car the maximum in comfort of which it

is capable. Well, summer is nearly here, and heaters are no longer the topic of accessory conversation; however, the fan is. Fans are really wonderful gadgets, but few people have them because few know they are available, and even fewer know their many uses. Now that air-conditioning has come in

*(Continued on page 61)*







A riveting machine with the ear-splitting noise removed. Quickly and silently this powerful hydraulic riveter in the Dodge truck plant "cold rivets" the brake shoe assembly to the rear axle housing of Dodge heavy-duty trucks. All that can be heard when the operator releases the terrific 70,000 lb. pressure of this remarkable machine is a muffled "clunk" as its brawny pincers snap into action. In an instant, a steel rivet one and three-quarter inches long and one-half inch in diameter is securely and permanently set.

#### Steering Knuckle Tie Rod Ends

An improvement has been made in the 1940 Pontiac front wheel tie rod ends incorporating a new type seal to give more adequate protection against entry of water and road dirt into these parts.

Front wheel tie rod ends are listed as 264942 right and 264944 left for the 1939 and 1940 models. These parts have now been superseded by part numbers 266658 right and 266657 left.

The seal, 505007 may also be used in place of the first type parts.



"Which do you want, buddy—a tow car or a garbage truck?"

# Service Hints

from

## THE FACTORIES

#### Flutter in Vacuum Gearshift Lever

If flutter is encountered in the vacuum gearshift lever used on the 1940 Chevrolet either at idle or during operation, it can be eliminated in the following manner:

1. Slip the forward end of the rubber boot off the rear end of the reactionary lever metal boot.

2. Remove the two bolts which fasten the two halves of the metal boot together and remove the top half.

3. Remove the piston rod yoke clevis pin and disconnect the piston rod yoke and valve link from the reactionary levers.

4. Pull out the vacuum cylinder valve rod and snap the friction spring Part No. 3655072 in place, with the closed end of the spring toward the back of the cylinder and about midway between the valve and the valve rod guide.

5. Reassemble by reversing above operations.

This flutter may in some cases cause high gear hop-out at high speeds.

#### Clutch Release Bearing

The clutch release bearing used on the Studebaker 1934, 1935, 1936, 1938 Dictator, 1938, 1939, 1940 Commander, light commercial car, 1939 and 1940 President model cars is now furnished only as an assembly consisting of the release bearing installed on the bearing collar. The bearing is not furnished as a separate part because of the possibility of the bearing being damaged during the process of installation, causing it to become noisy or to fail within a short period of operation.

The part number of the clutch release collar and bearing assembly for all models except the 1939 model 5C and 1940 model 6C Presidents, is 196944. The part number of the clutch release collar and bearing assembly for the 1939 model 5C and 1940 model 6C Presidents is 195402.

#### Valve Timing

Exhaust valve on 1940 Packard super eight and 160 should just close 10 deg. after top center with a drained hydraulic unit built up with feeler stock between plunger and end of valve stem to produce zero clearance when plunger is bottomed and engine valve is seated. It is not necessary to check the valve closing point as just described if the "O" marks on camshaft and crankshaft sprockets are together and aligned through shaft centers.

#### Car Serial and Engine Number Locations

Except for the first few 1940 Studebaker model 2G Champion cars, the serial number on all 1940 cars is located on a plate which is attached to the left front door hinge pillar. The first few 1940 model Champion cars were produced with the serial number located on a plate attached to the frame under the left front fender.

The engine numbers on the 1940 model cars are in the same location as the 1939 models. They are as follows:

Champion—on a machined pad at the upper left front of the cylinder block.

Commander—On a machined pad at the upper left front of the cylinder block.

President—On a machined pad on the upper center on the left side of the cylinder block.





## MOTOR AGE SHOP OF THE MONTH

Starting in business in 1920, servicing only Buicks and Pontiacs, Albert J. Grote (right) of the Albert & Harry Garage, Dayton, Ohio, now has one of the largest and busiest repair shops in the city—and services all makes of cars. The shop has an equipment investment of approximately \$6000—and all the equipment is kept busy. Personnel has increased steadily until Mr. Grote now employs five mechanics and one fender and body man.



## THE READERS' CLEARING HOUSE

# Service Men's Queries

### ASSORTED TROUBLES

*Please send me complete information on how to stop 1940 Chevrolet brakes from squeaking when applied, also how to take the clicking noise out of the speedometer and a cure for front ventilator glass which rattles when you accelerate from a slow speed in high gear to a faster speed.*

*I would also like you to explain how to set caster and camber on a 1939 JA Chevrolet. In the Chilton Manual, you give Caster 0, plus or minus  $\frac{1}{2}$  and camber  $\frac{1}{4}$  N, plus or minus  $\frac{1}{2}$ . Does this mean that caster can either be 0,  $\frac{1}{2}$  or  $\frac{1}{2}$  negative and be correct,*

*and that the camber can either be  $\frac{1}{4}$  negative,  $\frac{1}{4}$  positive or  $\frac{3}{4}$  negative and still be correct? Please explain.*

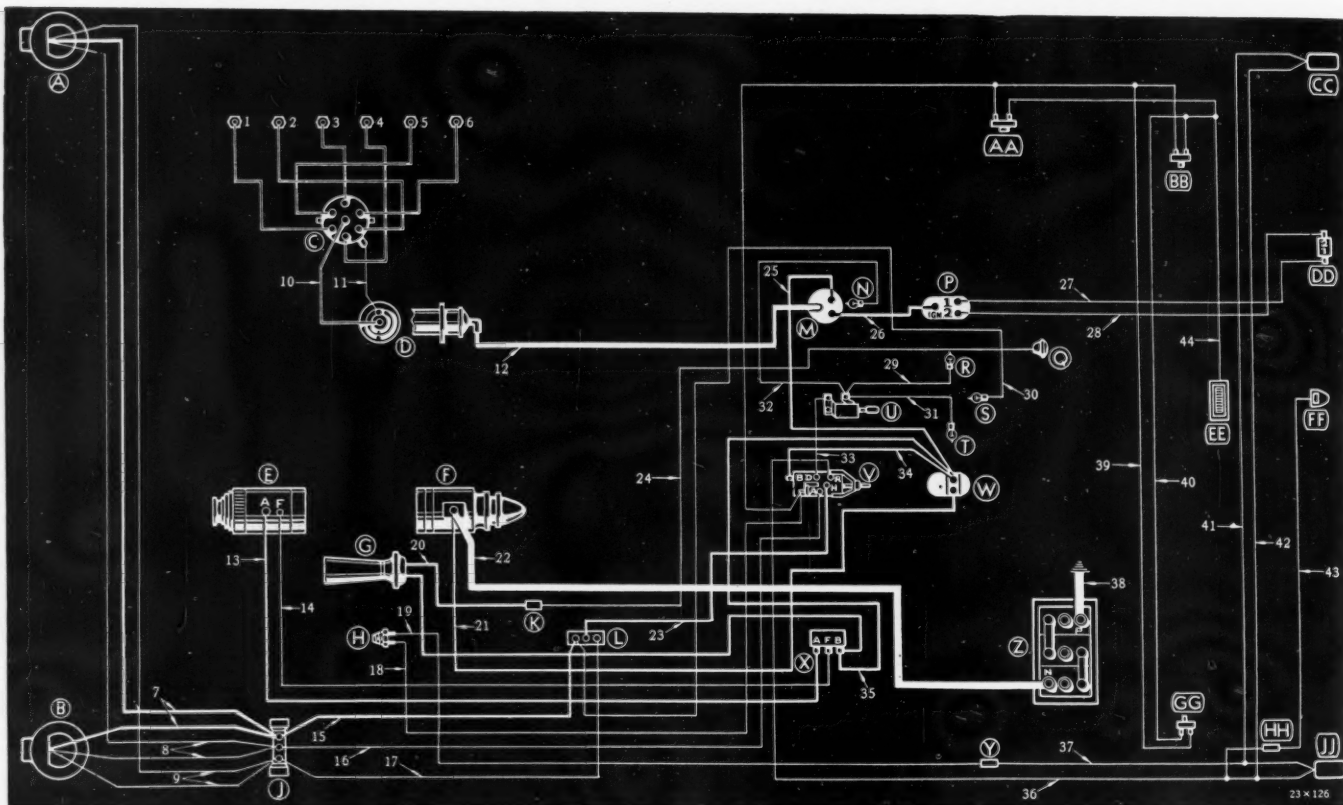
*Clyde Pirtle, c/o Central Garage,  
Titusville, Fla.*

**I**N reference to your query on squeaking Chevrolet brakes, this is caused by side play in the shoes. The shoes when installed should bear against the pads on the brake flange plates. If they do not contact the brake flange plate at each point, it will be necessary to bend the brake anchor plate in order to correct the condition.

On the speedometer, you can get a

special kit from Chevrolet, part No. 846870. The installation of this kit will enable you to insulate the speedometer from the dash, and in that way overcome your trouble.

In regard to the noisy ventilator, this is caused by the upper pivot being too pointed. In most cases, the difficulty can be overcome by adjusting the ventilator by means of the adjuster which is found underneath the garnish molding. If this does not overcome your trouble, remove the ventilator and strike the upper pivot several light blows with a hammer in order to swedge it out a bit and make  
(Continued on next page)



Wiring Diagram 1940 Plymouth

A. Headlight—right  
B. Headlight—left  
C. Ignition distributor  
D. Ignition coil  
E. Generator  
F. Starter motor and switch  
G. Horn  
H. Signal lamp switch  
J. Headlight cables terminal block  
K. Cable connector  
L. Headlight dimmer foot switch  
M. Ignition switch and lock  
N. Ignition switch light  
P. Fuel gage (panel unit)  
Q. Horn button  
R. Instrument light—right  
S. Headlight bright beam indicator light  
T. Instrument light—left  
U. Instrument light switch

V. Head and tail light switch and fuse  
W. Ammeter  
X. Voltage regulator  
Y. Cable connector  
Z. Battery  
AA. Reading lamp pillar switch  
BB. Reading lamp automatic door switch—right (7-pass. sedan and limousine)  
CC. Tail and signal light—right  
DD. Fuel gage (tank unit)  
EE. Reading light  
FF. Rear license plate light  
GG. Reading lamp automatic door switch—left (7-pass. sedan and limousine)

HH. Cable connector  
JJ. Tail and signal light—left  
1-6. Spark plug cables (high tension cable)  
7. Red  
8. Yellow  
9. Black  
10. Secondary cable (high tension cable)  
11. Primary cable (black)  
12. Ignition switch cable  
13. Red  
14. Green  
15. Red  
16. Yellow  
17. Black  
18. Red  
19. Red  
20. Green  
21. Red  
22. Starter cable and terminal (—) negative

23. Yellow  
24. Black  
25. Brown  
26. Blue  
27. Blue  
28. Black and Yellow  
29. Black  
30. Brown  
31. Black  
32. Black  
33. Black  
34. Brown  
35. Black  
36. White  
37. Red  
38. Battery ground cable and terminal (+) positive  
39. Red  
40. Yellow  
41. Red  
42. White  
43. White  
44. Yellow

(Continued from preceding page)  
it blunter, thereby causing it to fit better in the socket.

In regard to the caster, camber and toe-in, where we say that the caster can be 0 plus or minus  $\frac{1}{2}$ , it means that the caster can be anywhere between  $\frac{1}{2}$  deg. negative to  $\frac{1}{2}$  deg. positive, with 0 preferred. In regard to camber, it means that  $\frac{1}{4}$  deg. negative is preferred, but it can vary from  $\frac{3}{4}$  deg. negative to  $\frac{1}{4}$  deg. positive.

## VALVE SPRINGS

I am in a jam, and would like to know if you could help me out. I have been working on a 1939 Packard Six of the 1700 series, and have been having quite a little trouble with it. Every time I work on it I think I

have it whipped, but in a few days the man is back with it again. Now I will try to tell you how it acts.

To start with, the man had taken the car to another shop to have it tuned up, he had a little click in it. Well, what happened, they retarded the spark and took the click out, but the car got excessively hot, and it would not idle properly and never has since. He brought the car to me, which is when my trouble started.

I took a compression reading and found that No. 5 and No. 4 had only about 26 pounds, so I pulled the head, ground the valves, oh yes, by the way I found two exhaust valves warped badly, so put it back together, new valves, new gaskets, checked timing carefully, and it seemed to work O.K. It would idle down to about two miles an hour.

The owner took it out well pleased. A few days later he went to Florida and about five hundred miles out the same old thing again—the car wouldn't idle. When he got to Tampa, Florida, he took it to a shop there. They told him they knew just what was the matter with it—it was the fuel pump giving him the trouble they said.

So he had that fixed, and came on back the car working fine, but about two days after he got back the same thing happened—the car jerked and wouldn't idle.

As I forgot to tell you, when I first got the car the automatic choke was choking constantly—there was a port badly burnt in it and rather than have me repair it, he had me replace it with a new Carter carburetor designed for the car.

Well back to where he came back



from Florida, I took the car and checked it carefully, checked the valves, replaced the condenser, and contact points, took it out on the road and it worked perfectly for about a week, and the same old thing happened all over again—it wouldn't idle down more than ten miles an hour, especially when cold. At about 25 miles and up, the car runs fine, but just won't idle. If you could help me out I would appreciate it very much.

I am a new reader of MOTOR AGE, and also have the Chilton book. Henry W. Waldman, Vine Grove, Kentucky, RFD No. 2.

**I** BELIEVE I have the answer to the idling trouble you are having with that 1939 Packard Six, described in your letter of the 18th.

When you have the valves out, I assume you noticed that there are shakeproof washers on the tops of the valve springs, fitting into recesses of the block. If these washers are not put back in so that they fit squarely in the recess in the block, the valve spring will cock and hold the valve open. In addition to holding the valve open, this will also cause excessive wear in the valve guide. A compression reading will show pressure about 20 or more pounds less than the other cylinders. Also you will notice a warped valve and a burned seat.

After the proper kind of valve and carbon job, refacing the valve and reseating the block, it is necessary to recheck the springs after the valve keys have been installed. Take hold of the spring and rotate it, and you will hear it snap into place indicating that it has entered the recess in the block and that the shakeproof washer is square on its seat.

Since you mention that you found two exhaust valves warped when you did the job, it is quite possible that this cocked valve spring trouble was the original cause and that those valve guides are now worn so that the valve job you did is not standing up because the valves are not seating properly. The worn valve guide is not holding the stem at right angle to the seat.

My suggestion is that you pull the head and check the valves again, and if you find any valves warped, replace them, replace the valve guides, and do a careful job of reseating the block. Then be sure that you rotate the valve springs until they snap into place. Give the engine a good tune-up and your troubles will be over.

## BACK PRESSURE

I am an ardent reader of MOTOR AGE, and especially the "Readers Clearing House." I am having some trouble with a 1936 I.H.C. dual rear axle truck model C. S. 35. This truck has no pep whatsoever in the ordinary conventional gears. It takes from one-half to three-quarters of a mile to at-

tain a speed of forty-five miles per hour. On depressing the accelerator there is nothing there—you have to just sit and wait.

I have timed the ignition to flywheel marks, set the breakers to .020, spark plugs to .022, ground valves, cleaned carburetor, installed all new gaskets and a new throttle shaft. Compression is excellent and vacuum hand remains between 17 and 18 inches.

This is not a fixed jet carburetor (Zenith). On opening throttle quickly, it will snap right up, but if I don't ease it back, nine times out of ten it will die. Idles O.K. if eased back.

I would greatly appreciate any information you could give me. Dresden J. Harpster, Hampden, North Dakota.

**T**HERE are two things I would suggest doing on that 1936 I.H.C. truck. First of all, since you have only 17 to 18 inches vacuum, I would suggest advancing the spark until the engine pings. As you know, gasoline is much better today than it was in 1936 when that truck was built, consequently the spark can be advanced materially over the factory setting.

If this does not improve the performance as much as desired, I'd recommend that you either rebuild the carburetor yourself or have it rebuilt by a carburetor specialist.

Another important point is the muffler. If this is clogged and you are

getting back pressure, the engine cannot develop much power.

I'm inclined to think there are three reasons for your trouble—spark timing, poor carburetion or back pressure. I hope these suggestions will be of assistance to you.

## Want a Dollar?

On this page you see the birth of a new Motor Age cartoon feature—"Remember This One?" If you like it, we'll print one each month; each cartoon recalling some of you pet gripes and shop incidents which keep the repair business from ever growing dull.

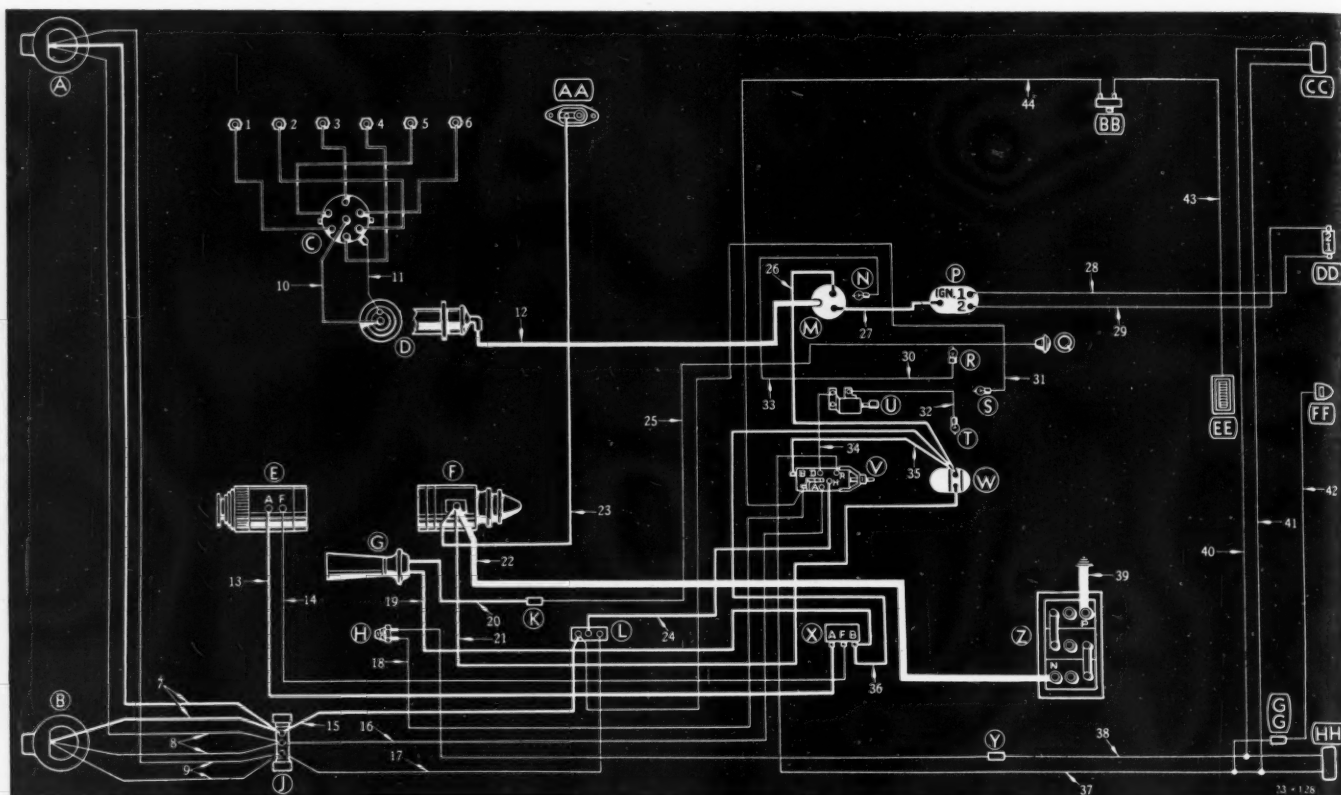
Here's easy money for you—just send in some ideas for this cartoon (needn't be polished—just the basic idea), and we'll send you a dollar for each suggestion of yours we use. In addition, we'll send you the original drawing of the cartoon which is based on your idea.

We can't promise to enter into correspondence over your suggestions or to return those we are unable to use. If you see your idea published with your name mentioned, you'll know your dollar and the original drawing will soon be on their way to you. If more than one of our readers suggest the same idea—well, it's first come first served.

It's the easiest way to earn a dollar you've ever heard. Drop us a line today and tell us one or two of the shop happenings which hand you a laugh or make your tear out your hair.

## REMEMBER THIS ONE?





Wiring Diagram 1940 Dodge

A. Headlight—right  
B. Headlight—left  
C. Ignition distributor  
D. Ignition coil  
E. Generator  
F. Starter motor and switch  
G. Horn  
H. Signal lamp switch  
J. Headlight cables terminal block  
K. Cable connector  
L. Headlight dimmer foot switch  
M. Ignition switch and lock  
N. Ignition switch light  
P. Fuel gage (panel unit)  
Q. Horn button  
R. Instrument light — right  
S. Headlight bright beam indicator light  
T. Instrument light—left

U. Instrument light switch  
V. Head and tail light switch and fuse  
W. Ammeter  
X. Voltage regulator  
Y. Cable connector  
Z. Battery  
AA. Automatic choke unit  
BB. Reading light pillar switch  
CC. Tail and signal light —right  
DD. Fuel gage (tank unit)  
EE. Reading light  
FF. Rear license plate light  
GG. Cable connector  
HH. Tail and signal light —left

1-6. Spark plug cables (high tension cable)  
7. Red  
8. Yellow  
9. Black  
10. Secondary cable (high tension cable)  
11. Primary cable (black)  
12. Ignition switch cable  
13. Red  
14. Green  
15. Red  
16. Yellow  
17. Black  
18. Red  
19. Red  
20. Green  
21. Red  
22. Starter cable and terminal (—) negative

23. White  
24. Yellow  
25. Black  
26. Brown  
27. Blue  
28. Blue  
29. Black and yellow  
30. Black  
31. Brown  
32. Black  
33. Black  
34. Black  
35. Brown  
36. Black  
37. White  
38. Red  
39. Battery ground cable and terminal (+) positive  
40. Red  
41. White  
42. White  
43. Yellow  
44. Red

## PUNCTURED DIAPHRAGM

I installed new piston rings, the best, on a 1934 La Salle 8 but I had only six cylinders hitting when I was finished. I also ground the valves. Timing is O.K., plugs O.K. When I put new plugs in the number 1 and 2 cylinders, they got so much oil on them that they wouldn't fire. I checked wires and distributor head. Condensor and points O.K. Cylinder head gasket O.K. No leak between. Please let me know what is the matter. Fred Gammel, Standard Stations, Inc., Millbrae, California.

FROM the description you have given of the trouble you are experiencing on that 1934 La Salle, I am inclined to believe that this is caused by a defective vacuum diaphragm in the fuel pump. I would suggest that you overhaul the fuel pump

replacing both diaphragms, and see if that doesn't cure your trouble.

As you know, if the vacuum diaphragm is punctured, oil will be drawn directly from the crankcase up to the intake manifold and in severe cases, it will foul the plugs, in those cylinders close to the point where the connection is made by the manifold.

If that doesn't overcome the difficulty, I'd check valve stems and valve guides for wear, connecting rod bearings for excessive oil throw-off, and cylinder bores for excessive wear. However, I'm quite sure you will find the trouble in the vacuum pump.

## DISTRIBUTOR LEAKS OIL

The boss has recently subscribed for MOTOR AGE again after being without it for some 18 months, and you don't know how glad I am to have it

again. I used to read "Shop Talk" and the "Clearing House" first, so of course that is what I turned to when I got time to look at the March number which came to my hand yesterday.

The first thing to draw my attention especially was a note that an "expert repairman named Pete Keeling over at Franklin, Ind., had sent in a remedy for an oil leak around a Chevie distributor shaft. I have a 1936 Chevrolet Pickup that can pump out a gallon of oil in 100 miles around the distributor. It did have a crooked shaft that caused the whole distributor assembly to wobble. I installed a new shaft but the oil still comes up around the outside of the distributor. If you think that Pete's cure will work in my case, please send me the details and I will give it a try. Do you think that a new oil pump would do any good?

I would like to also mention two experiences I have had with Fords burn-



ing out coils very similar to the case mentioned in the Clearing House by Viersen's Garage at Maywood, Neb.

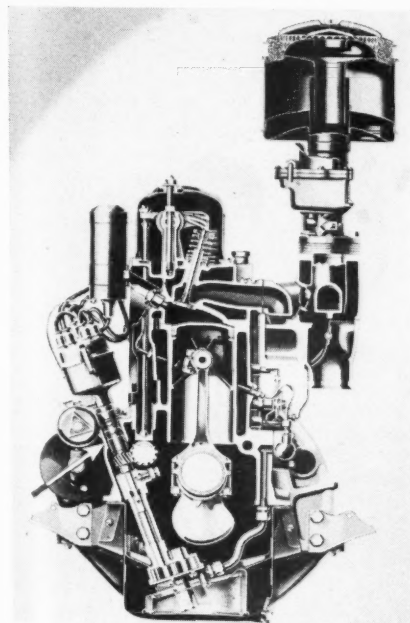
In each case the coils were short lived and the wax ran out all over the distributor. Also in each case I found that someone had wired around the resistance that is located on the inside of the dash near the light fuse. In each case the correction of this wiring with the addition of a new resistance in one case (since the old one was shot) fixed the trouble.

Please pardon the "free advice" but I simply wanted to pass on what I had learned from experience.

Lane Bryan, Williams Garage, Collbran, Colo.

I WAS certainly glad to hear how well you liked MOTOR AGE. Here's hoping you won't be without it again.

In regard to the oil leak around the Chevrolet distributor, the stunt is to remove the distributor and shaft and drill a hole at the point indicated by the arrow in the illustration. Then tap the outer section of the hole and put in a plug. This will permit the excess oil to drain through the hole on the side of the distributor.



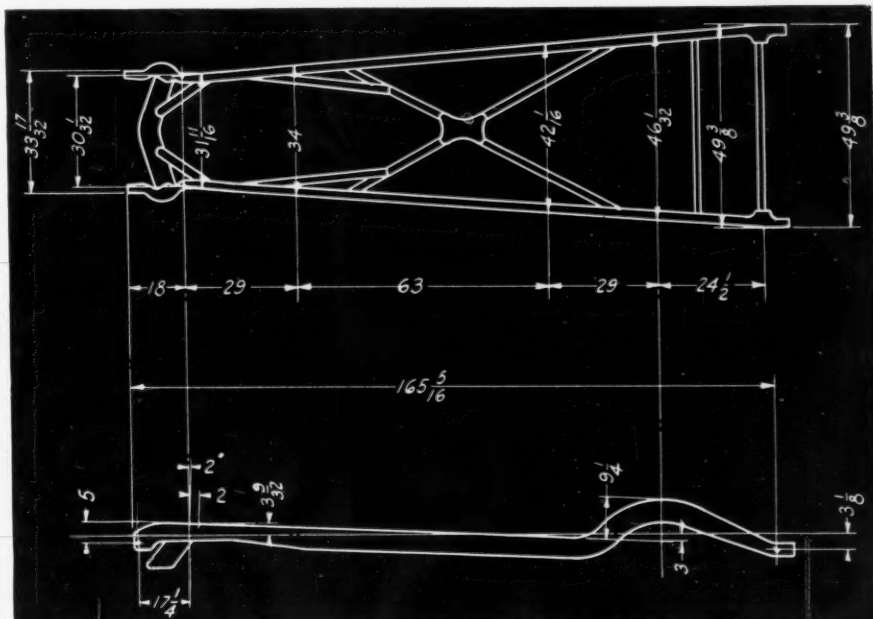
On some of the newer Chevrolets, they have a drain hole in the crankcase for draining off this excess oil. However, this drain often becomes clogged and it is necessary to clean it out. I don't think I'd bother trying a new oil pump until after you have made the oil drain as I have indicated.

Thanks for your tip on what causes Ford coils to burn out. I think you're 100 per cent right and I'm passing along your suggestion.

## JUMPS OUT OF GEAR

I am in charge of a fleet of trucks and have run into a tough one several weeks ago and am still puzzled with it, in fact it has got me down, so I am calling for help.

It is a 311 model Diamond T with



Frame Diagram 1940 Nash 4020

a JXB motor and in a hard pull it will jump out of reverse gear every time. We have had this transmission down three times and the last time we put in all new gears, bearings, countershafts and a new clutch and drive disk and still no luck. Can you help me on this job? We have three more of the same model, but not the same trouble. Oh yes, we also put on a new complete transmission cover with new forks.

This truck pulls a trailer but it will come out of reverse on a single truck as well as when it has a trailer on. Gentile Bros. Co., Haines City, Fla.

THAT is an unusual piece of trouble you are having on that model 311 Diamond T truck.

If you installed a new countershaft, countershaft cluster, reverse idler and reverse idler shaft, it would seem to me that the only remaining cause would be that the transmission case is sprung.

If you have not installed a new reverse idler and reverse idler shaft, I think it would be worth while trying these new parts to see if it would overcome your trouble. If not, I am inclined to think it will be necessary for you to install a new transmission case.

## EXTRA RESISTANCE

Checking over the wiring diagram of the Delco-Remy current and voltage regulator in your March issue of MOTOR AGE, 1940, I find that you have two resistance units in field circuit which it puzzles me to trace. So please state the purpose and why of this resistance, also state if the current regulator points and voltage regulator points close and open at the same time. Laurence Cochran, Box 763, Glendive, Mont.

AFTER re-checking the wiring diagram of the Delco-Remy current and voltage regulator which appears as Fig. 2 in the March issue of MOTOR AGE, I find the diagram correct as shown. As you point out, there are two resistances indicated, one for the current regulator and the other for the voltage regulator. In cases of excessive current, the field grounds through the lower resistance only. As you know, the current regulator protects the generator, while the voltage regulator protects the battery, each of course assisting the other. The regulators do not necessarily work together although they may. It depends entirely on the condition of the battery.

## OIL HOG

I have been a subscriber to MOTOR AGE for quite some time and feel as though we can't do without it now. We are in trouble and need some help on an "oil hog." Have recently overhauled a Pontiac-6 1936 model. It has gone about 3000 miles since the job, and is using an excessive amount of oil at speeds of 55 and over. We would like to have your opinion before going further. The oil all seems to come out of the rear breather pipe as though it might be blowby.

We pulled motor assembly out, replaced rings too, installed new main bearings, valve job, new timing gear and chain, aligned rod bearings (did not replace rod bearings as they weren't in very bad condition). Did have a leak in rear main but have stopped that. Installed rings by manufacturer's instructions. The taper in cylinders didn't exceed .006. Compression checked all the same. Please let us know if there is anything we might do to correct this job.

(Continued on next page)

(Continued from preceding page)

We also have had some trouble with Chevrolet clutch rattlers in '35 to '38 models. After replacing all new parts in two different cars, we still get that annoying rattle. We replaced clutch plate and pressure plate assembly throughout fork ball socket and bearing, and adjusted to factory clearance, but can't seem to take out the rattle on some jobs. Would like to know if there is something we can do to stop this. Ray Bracken, Winslow Motor Service, Taft, Cal.

**T**HE first thing I would do on that 1936 Pontiac Six would be to make an oil pressure test to see how much oil the bearings are leaking. It often happens that while the bearing has every appearance of being good and doesn't knock, still it throws off so much oil due to excess clearance along the sides, that an excessive amount of oil is consumed. If you don't have an oil pressure tester yourself, they are easily made or you will probably find that the jobber from whom you buy bearings has one which he will lend you.

I think it would also pay to tie a large sheet of oil cloth underneath the engine, take the car for a good long drive and see if there are any oil leaks present. Naturally if there is any oil leakage it would be caught in the cloth under the engine.

In reference to the clutch rattle you are experiencing in the Chevrolet cars on the 1935 to 1937 models, this is probably caused by uneven adjustment of the clutch fingers, or may be due to back lash in the transmission gear teeth. In case of back lash there is nothing much you can do as that play has to be there, but in some cases use of heavier grease would give some improvement.

On the 1938 models, it might be caused by the retaining springs which hold the pressure plate in contact with the diaphragm becoming weak, or the twelve studs holding the diaphragm spring assembly might work loose. In addition, the bolts on the clutch diaphragm in places will also be loose.

## WRONG PLUGS

I have been having trouble with a Packard 1937 120C car. It will cut out and start missing and spluttering after the car is going over 60 miles per hour. Speeds up to that point are O.K.

I have ground valves, installed new piston rings, new points and condenser, new mallory coil, new spark plugs and they test O.K. under pressure of 110 lb. They will fire in that air pressure. Have valves set at eight and ten thousandths, set while running and hot. Ignition is timed with timing light at 10 deg. before top dead center. Cam angle O.K. Tested distributor on tester at Auto-lite Station. Vacuum, 18 lbs. Carburetor Carter No. 366 with standard metering No. 75-228 rod. Float set at  $\frac{1}{8}$  in. I followed Packard instructions on all settings of carburetor and ignition and timing, valve settings, etc. Cut valve guides down to stop sticking. The only thing I haven't done is install new valve springs. Car starts fine and gives pretty good mileage. Fuel pump is good.

Kindly tell me just what can be done now? Did they have trouble with carburetor on that model or valve springs going bad?

John D. Oetjen, Mason Auto Repair & Service, Mason, Ohio.

**F**ROM the description you have given of the miss you are experiencing in the 1937 Packard, I am inclined to believe that the spark plugs you are using are of the wrong type, or that the valve springs are weak.

I would suggest that you try some colder running spark plugs, and also check the valve spring pressure.

## VALVE BREAKER

Could you help us out on this one? A 1937 Chevrolet truck used on a ranch has 25,000 miles on it now and for the last year about 9000 miles running; It has broken six exhaust valve stems in five different cylinders at about two months apart. They don't look like they get too hot. They crack at upper end of stem and the center lets go at last. So I have almost given it up. Please let me know what you think might be doing it.

Glen Long, 607 S. E. Dorian St., Pendleton, Ore.

**I**T'S rather difficult to find any reason why you break so many valves in the 1937 Chevrolet. Is it possible that someone has installed a cylinder head from another model Chevrolet, with the result that the valves strike the pistons?

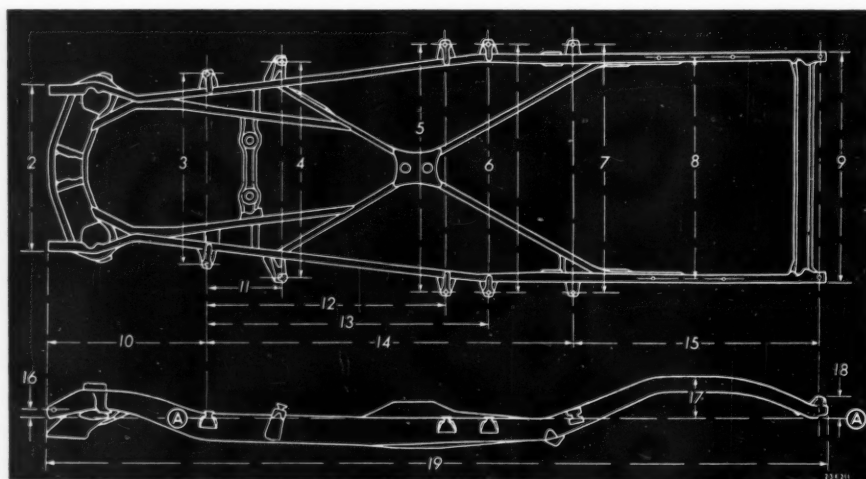
Or, is it possible that you have mixed up the rocker arms? There are three different kinds of rocker arms used for each engine, one for the exhaust and two different types for the intake valves. The intake valve arms have right- and left-hand angles. Right-hand angle arms are assembled to cylinders 1, 3 and 5. Left-hand angle arms are attached to cylinders 2, 4 and 6. Neither is interchangeable with the other.

## SHOP KINKS

(Motor Age will pay one dollar for each shop kink presented in this department. Address your contributions to Motor Age, 56th & Chestnut Sts., Philadelphia, Pa.)

**R**ECENTLY in the shop, we had a burned out center main bearing in a 1931 Chevrolet. We found that the babbitt had melted, and completely filled up the oil feed boring above this bearing, and we took care of it very simply in this manner. Without removal of the crank shaft, we merely drilled a  $\frac{3}{16}$  inch hole through the center of the crank shaft which allowed us to use a thin welding rod as a ram to dislodge the babbitt up through the oil feed well, by blowing through with air pressure. We finished the clearing operation, and assembled the job, and it has worked very well ever since. Jensen & Bedell, Inc., 76 Prince Street, Elizabeth, N. J.

**B**E sure that fan belt is real tight on Fords so that there is enough pressure on water to force the water through the entire cooling system. If loose, engine will heat easily. Earl Clifford, 585 20th Street, Oakland, California.



Frame Diagram 1940 Dodge

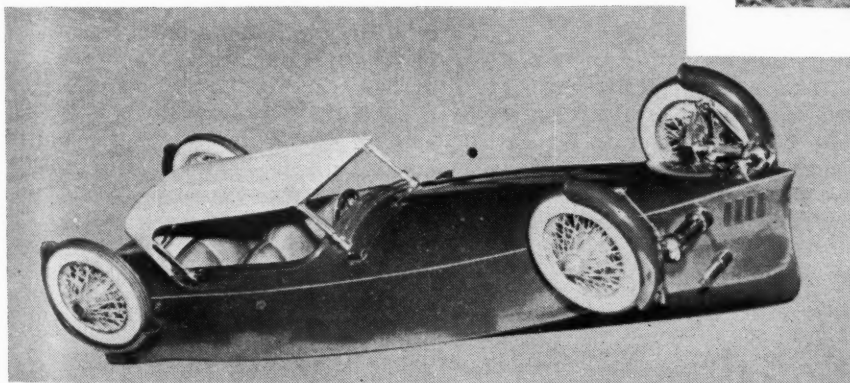
- A. Top line of frame
- 2. 35 (35 1/8—7 Pass.)
- 3. 40 1/2 (40 5/8—7 Pass.)
- 4. 45 5/8 (45 1/2—7 Pass.)
- 5. 52 3/8
- 6. 52 15/32 (52 17/32—7 Pass.)
- 7. 52 9/16 (52 5/8—7 Pass.)

- 8. 46 3/4
- 9. 48 1/4 (48 5/16—7 Pass.)
- 10. 36 11/32
- 11. 14 23/32
- 12. 50 3/32
- 13. 59 5/32
- 14. 77 27/32 (94 27/32—7 Pass.)

- 15. 50 13/16 (53 13/16—7 Pass.)
- 16. 1 1/8 (1 11/32—7 Pass.)
- 17. 9 5/16
- 18. 5 1/32
- 19. 166 5/8 (186 13/32—7 Pass.)



(Right) Mechanization of army units means added problems for the soldier. Service is necessary, but no one has yet invented a travelling hydraulic hoist. Here French soldiers solve their problem by making a service pit out of a natural woods gully.



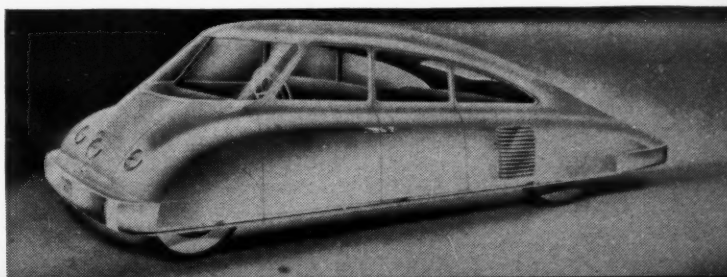
(Top Left) One of the many cars and drivers marooned near Poughkeepsie, N. Y., as swollen streams in the Hudson River valley flooded feeder roads to the state parkways. This scene was repeated in many places as snows melted.

(Center Left) Model of a sea-going auto that inventor Paul Pankotan plans to build in Miami, Fla. The retractable wheels are shown in "up" position.



(Lower Left) Gas rationing leads to this strange sight in London. A sedan fitted with a gas balloon is filling up at the offices of the Gas Light & Coke Co. Arrangements are being made for the establishment of gas service stations at many points in the city.

(Below) The rear-engined teardrop car of tomorrow as envisioned by Walter Dorwin Teague, industrial designer. The car features clear vision, extra seating capacity, built-in bumpers and airflow form. If Mr. Teague's vision is correct, you may see cars like this coming into your shop in the near future.



# WHAT'S THE TRUTH ABOUT VARNISH?

***Is it caused by gasoline or oil? An oil man gives his opinion for your attention***

**By W. R. MITCHELL**

WAVERLY PETROLEUM PRODUCTS CO.

THIS is the rebellious wail of a salesman, kicking against the experts. Here is an average drummer, returning the buck to technicians, and convinced that it ought to stick. His is a personal offensive against a barrage of what he holds to be misinformation fired by alleged experts.

It might as well come out now as later. I am the complaining salesman. My biggest complaint is with those highly technical arguments which are supposed to place the blame for "varnish" and "lacquers" on motor oil. I say it's spinach.

I also say that all modern motor fuels tend to form *gum*. Its nasty habit is spontaneous oxidization which starts to take place as soon as a modern motor fuel is stored, not only in storage tanks but also in the fuel tanks of the automobile.

Gum must ultimately find its way to moving parts of the engine, through "blow-by" to the crankcase, scraping action of the piston rings, and leakage around valve stems. You can even find it appearing in the crankcase in the form of sludge.

Finding its way into an engine, the gum causes sticking valves, clogged piston rings and generally poor performance. Now the average motor car sends two or three tons of fuel through its system in going ten thousand miles. Compare that with the insignificant poundage of motor oil it uses. Can't you begin to guess what is causing motor varnish?

Heaven knows I don't blame the

chemists for getting lost in possibilities. The gums, acids, asphaltenes, carbenes and water circulating with the crankcase motor oil have a swell chance to be further oxidized in the crankcase. Fuel engineers rest on the fact that engines run at approximately full load speed for 30 to 50 hours have frozen fast from motor "varnish." However, these gentlemen fail to state what type of fuel was used or to give any other details. Their claims have always been that high heat (250 deg.) caused a breakdown in the motor oil resulting in this "varnish" condition. "Pfui" on that!

Of course, motor oils *will* oxidize, and I say it is only contamination from outside sources that makes them fail. These contaminations definitely consist of motor fuels, gums, tars, acids, sulphurs, asphaltenes, carbenes, water, metal particles and atmospheric dust.

I say, that "varnish" in motor oil is the bunk—that it comes from contamination by modern motor fuels and foreign matter in the crankcase. I say, oil doesn't cause varnish, but frequent oil changes will prevent motor varnish.

Now that I have that off my chest—and if you are still with me—let's discuss what we are going to do about those motors that have been neglected, and those owners who are complaining about poor acceleration, bad idling, stalling, low gas mileage and excessive oil consumption.

You'll probably find these motors (and their owners, too, for all I

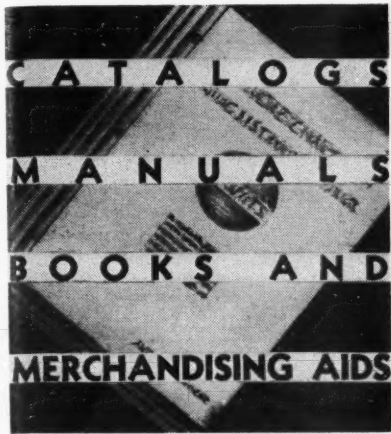
know) are sludged up with delayed valve action and plugged up oil rings. This condition occurs fairly early in the life of the motor (about 10,000 miles).

What are you going to do about it? Put in a set of points, regap the spark plugs and try to tune the motor? Don't kid yourself. This car is going right out to burn thousands of pounds of what I say is gum-laden fuel and you have missed the opportunity to win a steady repeat customer by failing to give satisfactory service.

Before attempting this tune-up job, you may, as thousands of other service men do, reach up on the shelf for a can of someone's tune-up oil. Well, maybe there's something in the idea. Let's see. "Tune-up oil" is a very much abused term and covers a multitude of products. As progress has been made in the producing of motor fuels, lubricating oils, and lubricants, progress has also been made in the manufacture of "tune-up oils" and their method of application. A product of high solvent power for all "motor varnish," sludge, tars and carbon binders is known as UVX-4. Its manufacturers have gone an important step further than just putting their product on the market. They have developed a special method of applying it to both the upper cylinders and the crankcase. Briefly, the device for applying this material to a motor consists of a series of rotary switches for the purpose of shorting out certain spark plugs in relation to the intake manifold arrangement. The solvent "tune-up oil" is then applied through a fixed metered opening direct to the proper venturi tube of the carburetor and is drawn into only those cylinders which have been shorted out. Now we find that the temperature of the shorted cylinders are no greater than the radiator water heat, and the force of compression (105-150 at 1000 r.p.m.) will cause the solvent to be forced down around the ring land and through the oil rings tending to free them of all forms of gum and carbon deposits. The exhaust stroke will eject a small amount of solvent around the exhaust valve to free it of gums and tars which cause delayed valve action. The solvent is also designed to dissolve the binders on the head of the piston so that the carbon will pass out the exhaust.

"Motor varnish" in the crankcase  
(Continued on page 57)





To receive a copy of the free literature mentioned in some of the following items, just check the square on the postcard on page 64 which corresponds to the letter given the literature you desire.

Sample charts of the new tractor lubrication chart announced by the LUBE-X Division of the Acme Corp., 1132 West 35th St., Chicago, Ill., will be sent upon request. Check "A" on the post card.

The DeVilbiss Co. of Toledo, Ohio, is offering free a copy of its booklet—The A B C of Spray Painting. It covers the subject of spray painting in five parts: the paint gun; material containers; hose and hose connections; air transformers and condensers, and air compression units. Check "B" on the post card for your copy.

A new catalog by United States Air Compressor Co., 5300 Harvard Ave., Cleveland, Ohio, features the new line of U. S. lubricating equipment and the U. S. jumping jack for lubricating cars while in motion. Copies will be sent to those who check "C" on the post card.

The Bendix Products Division of Bendix Aviation has developed a program for merchandising replacement Stromberg carburetors and repairs, with a complete and effective line of sales aids including counter displays, wall banners, posters, direct-mail pieces and sales presentations. The outstanding part of the program is a 30-minute sound slide film presenting the sales message.

The National Battery Manufacturers Association has just released their 1940 Data Book covering general specifications for original battery installations in trucks, buses and taxicabs. These data are of particular value to the battery manufacturers and dealers as a guide to the size and electrical capacity of replacement units. There is a separate edition of passenger car specifications. The truck data book is priced at 50 cents and the passenger car book is 25 cents.

Service shops using the RAMCO 10,000-Mile Guarantee Plan of sales promotion are now being furnished a large window decalcomania to identify them as "Authorized to issue the

(Continued on page 48)

## Are You Making the Most of What You Read?

### Manufacturers Will Help if You Give Them a Chance

The manufacturers who advertise employ experts to develop good products and employ experts to manufacture these products at the lowest possible cost in order to give you the biggest value possible. They employ experts to merchandise these products; to present them to you for what they are worth to you.

These progressive manufacturers then advertise their products in magazines like MOTOR AGE to acquaint you with their merits; how they are made and what they will do for you. They also develop literature describing their products so that you may know how their products will fit into your business. They are glad to send you such literature in response to your inquiries prompted by their advertisements. If you don't take advantage of this service which the advertisers offer, you must depend entirely upon the jobbers' salesmen to get further information about such products. This puts

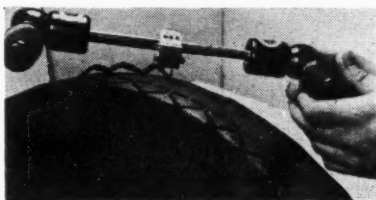
a tremendous burden on the jobbers' salesmen who sell several hundred items.

Then again, no one jobber sells all of the various products advertised. Wouldn't you be better off if you got the complete information about their products directly from the manufacturers and then asked the jobbers' salesmen to assist you in interpreting the information so received in applying the products to your particular needs?

Many advertisers give a tremendous lot of time and thought to the development of their products and the profitable use to which they can be put, and we believe that you will find it well worthwhile to inquire of these manufacturers direct and in doing so, take advantage of the special post card enclosed in this issue which will bring you complete information about all the products in which you are interested.

### Van Tire Regroover

Van Tire Tools, Inc., 160 North 22nd St., Philadelphia, Pa., has developed a new tire regrooving tool for which three distinct advantages are claimed: clear vision while working, an adjustable head for various combinations of cuts, and scientifically



designed blades for easy cutting. A life-time heating unit is incorporated, and handles are designed to remain

cool. The tool, with an assortment of blades and a complete course of instruction in its use, is supplied as a unit and priced at \$19.75.

### Wonder Solv Latest

#### Miller Product

A new product for removing rust and scale and for preventing further accumulation has been announced by Miller Mfg. Co., Camden, N. J., makers of WonderWeld. The new product is known as Wonder Solv, and is said to mix harmlessly with any anti-freeze, and to be non-injurious to metal, rubber, paint, fabric or skin. Its action is reported to be that of turning rust into a liquid form instead of loosening the rust scale in pieces.



"Follow that car—and next time YOU get one with a running board on it!"



It's not only the flowers that feel the growing urge in the spring. Seems like the solar vitamins are also having an effect on the automotive industry, for there appears to be a budding crop of new plant buildings and additions. A few of the expansion reports that have come our way reveal that Chrysler Corp. is building a new 78,000 sq. ft. building at its Highland Park plant—Packard Electric division of General Motors is undertaking an immediate building program that will add 75,000 sq. ft. of floor space and include construction of a new two-story building—Cummins Engine Co. is spending \$75,000 for a new building and \$125,000 for machine equipment to fill it—Ford is spending \$1,175,000 in expanding and remodeling its plant at Windsor, Ont.—Elastic Stop Nut Corp. recently broke ground for a new plant at Union, N. J.—Mueller Electric Co. is now building a 6,000 sq. ft. floor space addition to its plant at Cleveland.

Special award for highest ranking in the automobile industry on safety design was presented to Plymouth division of Chrysler Corp. at the eleventh annual eastern Safety Conference in New York on April 18. The 1940 Trophy for safest auto design was formally presented to D. S. Eddins, Plymouth's president, by the Publication Safety Engineering which made the comparative study of present model cars.

Regular production of buna, a synthetic rubber already tested and widely used abroad, has started in this country. Firestone Tire & Rubber Co. has just completed the necessary license agreements with Standard Oil Development Co. (New Jersey) United States patent holders.

Of the various types of buna produced, only two are under consideration for immediate production by Firestone. Buna N, now also called perbunan, will receive the major attention because it lends itself to many mechanical rubber goods. Buna S, used abroad in auto tires, is expected to play a minor role in tire production in this country because of its prohibitive cost.

Reo's 1940 truck program has been augmented by a line of five Diesel powered models ranging in capacity from 13,000 lb. to 22,000 lb. Each model will be built in three standard wheelbases of 120, 145 and 165 in.

The company reports that it will start production of its 1940 line about the middle of this month. Full output is expected to be reached about June 1 with a daily output of 40 trucks.

Federal Motor Truck Co. has announced four new heavy-duty models

at rated capacities from 3½ to 7½ tons.

And, while we're speaking of trucks, a new Stewart Motor Corp., taking the name of the former Buffalo concern, now in liquidation, has started manufacture of trucks under the Stewart name at a Buffalo plant. The new company will concentrate princi-

pally on the manufacture of three large models similar to the larger units formerly produced at the old plant.

If you're interested in buying cars by the pound, you'll be interested in the statement by the Automobile Manufacturers Association that a complete motor car in the low-price class costs about 26 cents per pound—which is cheaper than steak or butter.

## Exide Appoints Two

Roland Whitehurst, formerly manager, Washington branch, The Electric Storage Battery Co., manufacturers of Exide batteries, has been appointed assistant general sales manager with headquarters at the home office of the company in Philadelphia.

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1939 Pontiac Quality Six, Model 39-25 .....	February	38
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Gilmore-Yosemite Economy Run Results .....	February	36
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1939 Studebaker Commander .....	January	24
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1939 Buick Series 40-60 .....	June	26
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1939 Chrysler C-22 .....	July	24
1939 Chrysler C-23 .....	July	25
1939 Chrysler C-24 .....	August	25
1939 Pontiac Eight .....	September	22
1939 De Soto & Dodge .....	October	24
1939 Studebaker Champion .....	October	26
1939 Hudson 112 .....	November	25
1939 Hudson Pacemaker & Six .....	November	26
1940 Buick Series 40-50-60 .....	December	72

## Weaver Has New Testers

The Weaver Mfg. Co., 2177 S. Ninth St., Springfield, Ill., has announced several new testers.



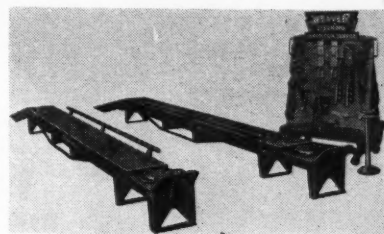
A new electronic tachometer which operates from the primary ignition circuit is designed to test engines for peak performance, ignition timing, spark plug and point setting and other points of

engine tune-up.

This handy little tool takes the place of the various tools used by mechanics to remove hub and grease caps. One end is designed to fit easily between the hub cap and the wheel, while the other end takes a firm grip on the hub grease cap for quick removal. One side acts as a hammer for tapping the cap in place.



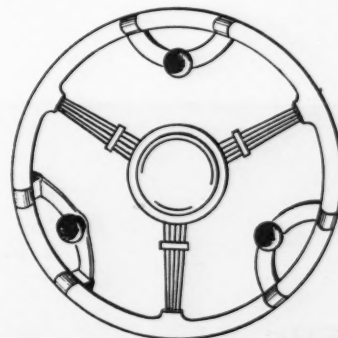
The latest model Weaver alignment outfit shown consists of the standard alignment rack, portable wheel alignment indicator, camber-caster-king pin gage, two turning radius gages,



offset axle straightener, jack stand, camber and caster correctors, tubular axle adapters and a tool display board.

## Steering Wheel Pilot Knob

A steering wheel pilot knob that is attached to the steering wheel so that the knob is recessed to the level of the wheel rim rather than projecting above the rim has been announced by Hercules Automotive Sales Corp., 409



Thorpe Bldg., Minneapolis, Minn. Firmly attached to the rim at two points, the knob is said to be strong and sturdy, and to lessen driving fatigue. List price \$1.00.

# KING QUALITY THE COMPLETE PARTS LINE



WATER PUMP  
PARTS

BUSHINGS BEARINGS

PISTON PINS PISTON RINGS

PISTONS VALVES

CYLINDER SILENT-U  
SLEEVES SHACKLES

BOLTS

WHEEL SUSPENSION  
PARTS

# KING QUALITY THE COMPLETE PARTS LINE



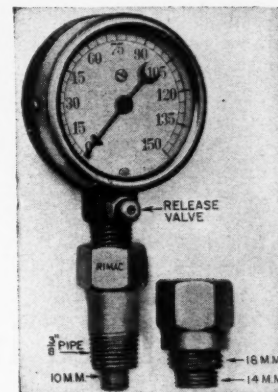
# Valve Spring Pressures

## Rimac Has New Gages

Introduction of two new gages has been announced by Rinck-McIlwaine, Inc., 16 Hudson St., New York City. A compression tester with a range from 0 to 150 lbs. is one of the new items. It has a release valve located under the dial face, and is threaded for 10 mm., 14 mm. and 18 mm. spark plug openings with an extra bushing available for 1/8 in. S. A. E. thread. Priced at \$3.00.



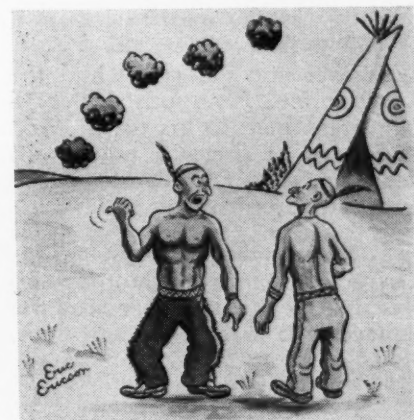
A new vacuum gage with a range from 0 to 30 in. is the other new item. It is built with shock-proof indicating mechanism for routine testing of all



type of gasoline engine, fuel lines, windshield wipers and vacuum power brake systems. Price \$2.25.

## Croft Bearing Washer

Fast and economical washing of large bearings up to 12 in. in diameter used in bus and truck service is claimed for the Croft bearing washer offered by the Ahlberg Bearing Co., 4702 So. Whipple St., Chicago, Ill. In operation, the container is filled half full of cleaning fluid; the bearing is placed on the cone and the gun is employed to force cleaning liquid all through the bearing.



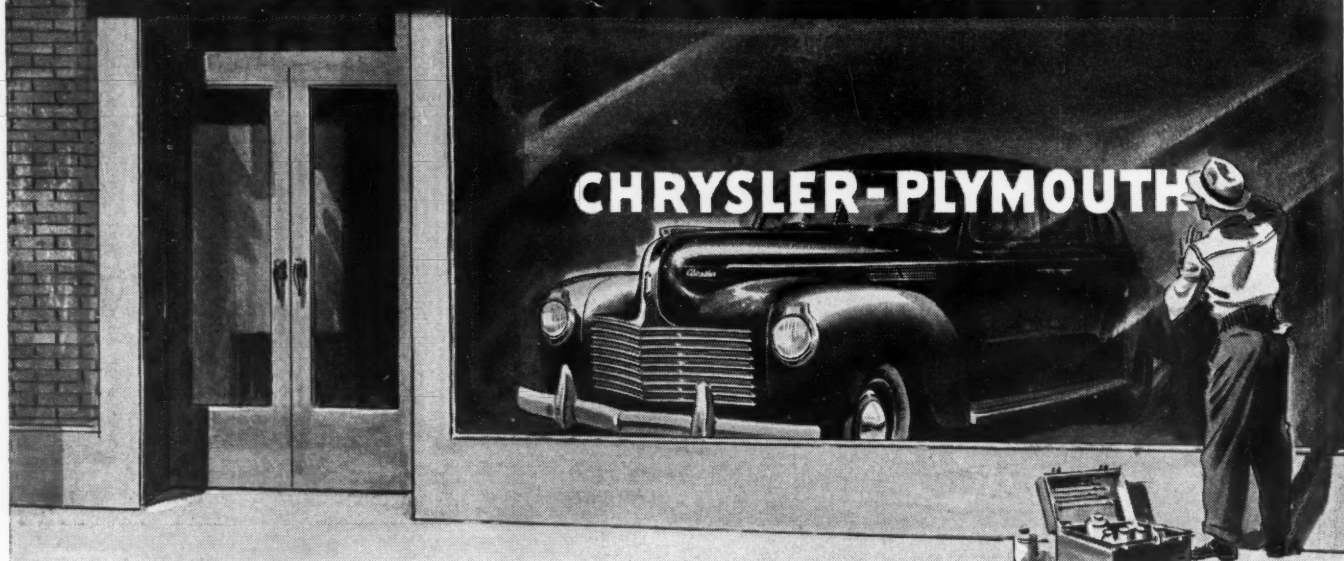
"Smoke signals nothing! That's big chief Flatfoot with a rich mixture in his car again!"

MAKE AND MODEL OF CAR		VALVE SPRINGS			
		VALVE OPEN		VALVE CLOSED	
		Pressure (Aver.) Pounds	Length Inches	Pressure (Aver.) Pounds	Length Inches
Year					
<b>AUBURN</b>					
8-100, 8-100A	1932	90	1 1/8	49	2 1/8
12-160, 12-160A	1932	95	1 1/8	49	2 1/8
8-101, 8-101A, 8-105, 652X, 652Y, 850X, 850Y	1933-34	91	1 1/8	44	2 1/8
12-161, 12-161A, 12-165, 1250	1933-34	122	1 1/8	60	2 1/8
653, 851, 654, 852	1935-36	91	1 1/8	45	2 1/8
<b>BANTAM</b>					
60	1938		1	34	1 1/4
60	1939-40	44	1	28	1.687
<b>BUICK</b>					
32-50	(Inner) 1932	27 1/2	1 1/8	10	1 1/8
32-50	(Outer) 1932	77	1 1/8	27 1/2	1 1/8
32-60, 32-80, 32-90	(Inner) 1932	52	1 1/8	14	1 1/8
32-60, 32-80, 32-90	(Outer) 1932	85 1/2	1 1/8	30 1/2	1 1/8
33-60, 33-80, 33-90	(Inner) 1933	58	1 1/8	22 1/2	1 1/8
33-50	(Inner) 1933	39	1 1/8	12 1/2	1 1/8
33-50, 33-60, 33-80, 33-90	(Outer) 1933	99 1/2	1 1/8	37 1/2	1 1/8
34-40, 35-40, 34-60, 35-60, 34-90, 35-90	(Inner) 1934-35	58	1 1/8	22 1/2	1 1/8
34-50, 35-50	(Inner) 1934-35	39	1 1/8	12 1/2	1 1/8
All models	(Outer) 1934-35	99 1/2	1 1/8	37 1/2	1 1/8
36-40, 36-60, 36-80, 36-90	(Inner) 1936	56	1 1/8	24	1 1/8
36-40, 36-60, 36-80, 36-90	(Outer) 1936	84 1/2	1 1/8	33 1/2	1 1/8
37-40, 37-60, 37-80, 37-90	(Inner) 1937	48	1 1/8	18	1 1/8
37-40, 37-60, 37-80, 37-90	(Outer) 1937	70	1 1/8	29	1 1/8
38-40, 38-60, 38-80, 38-90, 39-40, 39-60, 39-80, 39-90	(Inner) 1938-39	48	1 1/8	18	1 1/8
38-40, 38-60, 38-80, 38-90, 39-40, 39-60, 39-80, 39-90	(Outer) 1938-39	70	1 1/8	29	1 1/8
40-40, 40-50, 40-60, 40-70, 40-80, 40-90	(Outer) 1940	70	1.593	29	1.937
40-40, 40-50, 40-60, 40-70, 40-80, 40-90	(Inner) 1940	48	1 1/8	18	1 1/8
<b>CADILLAC</b>					
355B, 355C	1932-33	171	2 1/8	79	2 1/8
370B, 370C, 355D, 370D, 452D	(Inner) 1932-35	52	1 1/8	20	1 1/8
370B, 370C, 355D, 370D, 452D	(Outer) 1932-35	116	1 1/8	50	1 1/8
452B, 452C	(Inner) 1932-33	52	1 1/8	20	1 1/8
452B, 452C	(Outer) 1932-33	90	1 1/8	45	1 1/8
36-60, 36-70, 36-75, 37-60, 37-65, 37-70, 37-75	1936-37	146	1 1/8	66	1 1/8
36-80, 36-85, 37-85	(Inner) 1936-37	52	1 1/8	20	1 1/8
36-80, 36-85, 37-85	(Outer) 1936-37	116	1 1/8	50	1 1/8
36-90, 37-90	(Inner) 1936-37	52	1 1/8	20	1 1/8
36-90, 37-90	(Outer) 1936-37	116	1 1/8	50	1 1/8
38-60, 38-65, 38-75	1938	145	1 1/8	66	1 1/8
38-90	1938	95	1 1/8	49	1 1/8
39-61, 39-60S, 39-75	1939	145	1.581	66	1.926
39-90, 40-90	1939-40	98	1.482	50	1.772
40-60S, 40-62, 40-72, 40-75	1940	145	1.581	66	1.926
<b>CHEVROLET</b>					
BA, CC, CA	1932-33	98	1 1/8	47	1 1/8
DC	1934	75	1 1/8	40	1 1/8
DA, EC, EA, ED, FC, FA, FD	1934-36	98	1 1/8	45	1 1/8
GB, GA	1937	98	1 1/8	45	1 1/8
HB, HA, JA, JB	1938-39	130	1 1/8	53	1 1/8
KA, KB, KH	1940	127	1.500	52	1.812
<b>CHRYSLER</b>					
CL, CP	1932	78	1 1/8	42	2 1/8
CH, CL, CL*	1932-33	83	2 1/8	53	2 1/8
CO, CT, CQ	1933	78	1 1/8	42	2 1/8
CA, CB, C6, CZ, C7, C8, C14, C15	1934-37	107	1 1/8	48	2 1/8
CU, CV, C1, C2, C3, C9, C10, C11, C17	1934-37	107	1 1/8	48	2 1/8
CW	1934	83	2 1/8	53	2 1/8
CW*	1935	85	2 1/8	53	2 1/8
C16, C18	1937-38	105	1 1/8	43	1 1/8
C19, C20	1938	126	1 1/8	55	2 1/8
C22	1939	105	1 1/8	42	1 1/8
C23, C24	1939	126	1 1/8	55	2 1/8
C25	1940	111	1.375	42	1.750
C26, C27	1940	133	1.656	55	2.031
<b>CORD</b>					
810, 812	1936-37	122	1 1/8	60	2 1/8
<b>CROSLEY</b>					
A	1940	41	1.234	20	1.500
<b>DE SOTO</b>					
SC, SD	1932-33	78	1 1/8	42	2 1/8
SE, SF, SG, S1, S2	1934-36	107	1 1/8	48	2 1/8
S3, S5	1937-38	105	1 1/8	43	1 1/8
S6	1939	105	1 1/8	42	1 1/8
S7	1940	111	1.375	42	1.750
<b>DODGE</b>					
DL, DK, DO	1932-33	78	1 1/8	42	2 1/8
DP, DR, DS, DU, D2, D5, D8	1933-38	80	1 1/8	36	1 1/8
D11	1939	80	1 1/8	36	2 1/8
D14, D17	1940	80	1.437	36	1.750
<b>DUESENBERG</b>					
J	(Inner) 1932-37	38	1 1/8	26	1 1/8
J	(Outer) 1932-37	68	2 1/8	38	1 1/8
<b>FORD</b>					
B	1932	72	2	36	2 1/8
18, 40, 48	1932-35	64		42	
68	1936	64		34	
74, 80	1937-38	50	1 1/8	28	2 1/8
78, 85	1937-38	69	1 1/8	37	2 1/8

Turn to page 43. Please

Turn to page 43, Please

# AN *OPPORTUNITY* IN TOWNS OF EVERY SIZE!



## There is a Future for **YOU** with a Chrysler and Plymouth Dealership!

**M**AKE your own opportunity! Investigate the Chrysler and Plymouth franchise and you'll find out how you can make money in a small town or a big city, because everybody who drives a car is your logical prospect.

Maybe you've got a small business now that only needs a complete line of cars to make it a real money-maker. Or you might join someone who wants to get into business too.

### In Towns of Every Size

Wherever you go, you'll find the Chrysler and Plymouth dealer an important man in his town. And there's room for still more such dealers, because Chrysler and Plymouth sales are growing so fast.

### A Market that Renews Itself

There are 30,000,000 motor vehicles in America, so every year the replacement market is enormous.

Every year the Chrysler and Plymouth owner group grows bigger and bigger... therefore, so do the dealer's opportunities for profit.

### Every Buyer a Prospect

Do you realize that this great combination covers every price class, from the lowest to the luxury field? Plymouth, with its sensational growth in the low-price field. Chrysler Royal, just above Plymouth in the great low-medium price market. Several other beautiful Chryslers completely blanketing the medium-price field. Chrysler Crown Imperial, the most luxurious fine car you can imagine.

No wonder Chrysler and Plymouth dealers are win-

\*All prices delivered in Detroit including Federal tax. Transportation, State and local taxes, if any, and special equipment extra.

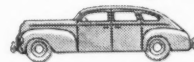
ning! In certain territories, openings are available. If you're looking for an opportunity, write to Chrysler Corporation, 12200 East Jefferson Avenue, Detroit.

### COMPLETE MARKET COVERAGE

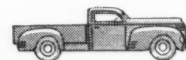
— Every Buyer is Your Prospect!



**Plymouth Roadking**... one of a line of great new Plymouths at \$645\* and up.



**Chrysler Royal Sedan**... a great big quality car for only \$995.



**Plymouth Commercial Cars**... \$585 and up... chassis and cab \$555.



**Chrysler Traveler**... one of eleven Traveler, New Yorker and Saratoga types, \$1095 to \$1450.



**Chrysler Royal Coupe**... one of 13 Royal and Windsor models, from \$895 to \$1350.



**Chrysler Crown Imperial**... Chrysler's Finest, three luxury styles, \$2245 to \$2445.

# *THE WHOLE TRADE IS TALKING CHRYSLER!*



## Engine Valve Spring Pressures—Cont.

MAKE AND MODEL OF CAR		VALVE SPRINGS			
		VALVE OPEN		VALVE CLOSED	
		Pressure (Aver.) Pounds	Length Inches	Pressure (Aver.) Pounds	Length Inches
Year					
FORD—Continued					
V8-60	1939-40	50	...	28	2.05
V8-85	1939-40	78	...	38½	2.13
FRANKLIN					
16, 16B, 17, 17B, 18A, 18B, 18C, 19A, 19B	(Inner) 1932-34	46	1½	20	2
16, 16B, 17, 17B, 18A, 18B, 18C, 19A, 19B	(Outer) 1932-34	65	1½	35	2½
GRAHAM					
53, 54, 56, 58, 65, 68, 73	1932-33	97	1¾	53	2½
64, 57A, 67, 69, 72, 75	1933-35	106	1¾	50	2½
74	1935	73	1¾	33	1½
80, 80A, 90, 90A, 110, 85, 95, 116, 120	1936-37	87	1½	34	1½
Standard, Special, Supercharger	1938	87	1½	34	1½
96, 97	1939	93	1.375	44	1.656
107, 108	1940	98	1.343	44	1.656
HUDSON					
T, U, L	1932-33	102	1½	44	...
E	1932	102	1½	44	...
LT, LTS	1934	104	1½	53	2
LL, HT, HU, HHU, HTL, HUL, 64, 65, 66, 67	1935-36	102	1½	44	2
GH, 63, 73, 83	1935-38	102	1½	44	2
74, 75, 76, 77, 84, 85, 87	1937-38	102	1½	44	2
Terraplane (81, 82)	1938	102	1½	44	2
90, 92, 93, 95, 97, 98	1939	80	...	40	...
40, 41, 43, 44, 47	1940	80	...	40	...
HUPMOBILE					
B216, B316	1932-33	80	1¾	48	2½
F222, 1226, F322, 1326	1932-33	46	1½	19	2¼
K321, KK321A	1933	85	1½	34	2½
417W, 421J, 517W, 521J, 518D, 521O, 618G, 621N	1934-36	100	1½	40	1½
427T, 527T	1934-35	115	2½	55	2½
R915, 922E, 925H	1939	100	1½	40	1½
LA FAYETTE					
110, 3510, 3610	1934-36	76	1½	45	2
LA SALLE					
345B, 345C	1932-33	171	2½	79	2½
350	1934	96	1½	43	2¼
35-50, 36-50	1935-36	116	1½	43	2¼
37-50, 38-50	1937-38	145	1½	66	1½
39-50, 40-50, 40-52	1939-40	145	1.581	66	1.926
LINCOLN					
501 to 510	1932	92	3½	...	...
231 to 250	1932	...	...	...	...
511 to 520	1933	...	...	...	...
251 to 270	1933	...	...	...	...
521 to 531, 271 to 290	1934	...	...	63	...
301 to 311, 541 to 548, 321 to 341	1935-36	193	2½	63	2½
351 to 375, 401 to 425	1937-38	135	2½	58	2½
V12	1939-40	135	2.343	57	2.687
LINCOLN-ZEPHYR					
900 series, HB series	1936-37	64	...	34	...
700 series	1939-40	116	...	54	...
MERCURY					
V8, 95	1939-40	78	...	38½	2.13
NASH					
960	1932	76	1½	45	2
970	1932	75	1½	45	2
980	(Inner) 1932	40	1½	18	1½
980	(Outer) 1932	103	1½	40	1½
990	(Inner) 1932	40	1½	18	1½
990	(Outer) 1932	103	1½	40	1½
1060	1932	90	1½	45	2
1080	(Inner) 1932	40	1½	18	1½
1080	(Outer) 1932	103	1½	40	1½
1090	(Inner) 1932	40	1½	18	1½
1090	(Outer) 1932	103	1½	40	1½
1070, 1170	1932-33	90	1½	45	2
1120	1933	90	1½	45	2
1130	1933	90	1½	45	2
1180	(Inner) 1933	40	1½	18	1½
1180	(Outer) 1933	103	1½	40	1½
1190	(Inner) 1933	40	1½	18	1½
1190	(Outer) 1933	40	1½	18	1½
1220	(Inner) 1934	40	1½	21	1½
1220	(Outer) 1934	112	1½	65	1½
1280	(Inner) 1934	40	1½	18	1½
1280	(Outer) 1934	40	1½	18	1½
1290	(Inner) 1934	40	1½	18	1½
1290	(Outer) 1934	103	1½	40	1½
3520	(Inner) 1935	40	1½	21	1½
3520	(Outer) 1935	112	1½	65	1½
3580	(Inner) 1935	40	1½	21	1½
3580	(Outer) 1935	112	1½	65	1½
3640, 3640A	1935-36	117	1½	69	2
3620	(Inner) 1936	40	1½	21	1½
3620	(Outer) 1936	112	1½	65	1½
3680	(Inner) 1936	40	1½	21	1½
3680	(Outer) 1936	112	1½	65	1½
3720	(Inner) 1937	52	1½	22	1½
3720	(Outer) 1937	96	1½	40	1½
3780	(Inner) 1937	52	1½	22	1½
3780	(Outer) 1937	96	1½	40	1½
La Fayette-3710	1937	117	1½	69	2

Turn to page 45, Please

## Replacement Filter

A new replacement cartridge type oil filter for all cars, trucks, tractors and motorized equipment has been announced by the Pick Mfg. Co., West Bend, Wis. The filter mounts in the same brackets used by the original

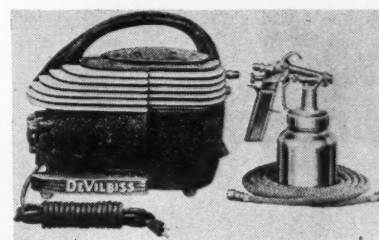


equipment filter, and is also available complete with all fittings and mounting brackets for installation on cars not originally equipped with a filter. It is identified as the Pick Honey Filter No. P3 and lists, without fittings, for \$2.70.

## Small-Spray

### Painting Outfits

A new line of small paint spraying outfits has been announced by the DeVilbiss Co., 300 Phillips Ave., Toledo, O. The line consists of five different spray equipment assemblies, each powered with a ¼-hp. electric motor driven air compressor unit.



Three of the new assemblies are cup gun outfits, and two include a pressure feed paint tank of two gallon capacity.



"They came in here in the first place because they both thought they had the right of way!"

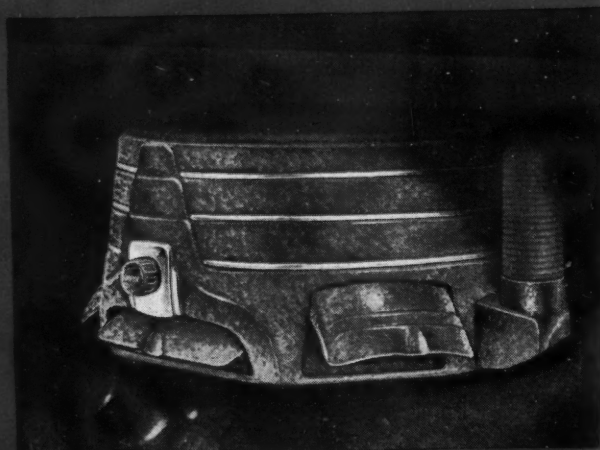


*"You should order these new  
dash and underseat heaters now"*

# ARVIN

**HOT WATER CAR HEATERS**

**HOTTER**  
*than ever!*  
**FASTER**  
*on warm up!*

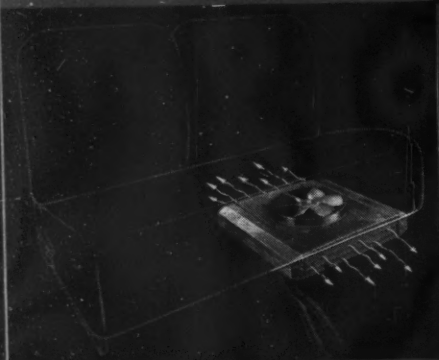


*New Dash Model 72-G*

**They're all new and more powerful heaters.**

The complete line includes three fine dash models—an underseat heater—plus an auxiliary heater-defroster . . . Special fast warm-up equipment, with oversized (7/8-inch) water lines, is available for installation of 72-G dash model on Ford-built cars, Chrysler-built cars, and Chevrolet—universal fittings for all other cars. List prices range from \$14.95 to \$17.95 on this sensational car heating system. Two other dash models—62-G at \$12.95—52-G at \$9.95—are complete with universal fittings for all cars. All dash models have double defroster outlets. Defroster fittings list at \$3.95 . . . *The new Arvins have so many improved features—and the Arvin dealer-profit-building plans are so comprehensive—we can't begin to tell you about them here. See your Arvin jobber for full information.*

NOBLITT-SPARKS INDUSTRIES, INC., Columbus, Indiana

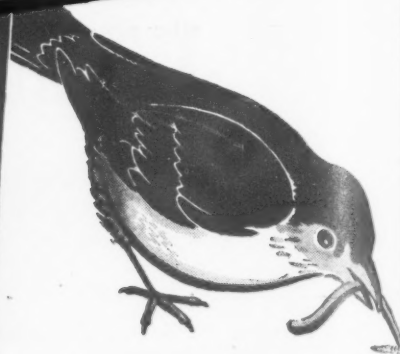


*New Underseat Model 82-G*

This new type Arvin will be a big seller for you. Easily installed under front seat of many cars. Fan-forces heat direct to the front and rear compartments.  
List price . . . . . \$16.95



Auxiliary Heater-Defroster for series installation with underseat heater, \$6.95 list. For independent installation . . . . . \$7.95



**EARLY BIRD  
DEAL!**

**Brings You All-Metal Service  
Station Chair FREE with early  
ARVIN Heater orders on Late  
Fall Dating . . .**

An order for 8 of the new Arvin dash or underseat heaters, and 4 defrosters, placed with your jobber in May, June, or July, entitles you to one Arvin All-Metal Service Station Chair Free. Limit—2 free chairs to a customer. Heaters and free chairs are delivered by August or sooner if desired. Your jobber gives you a late Fall dating on the heaters. Remember—you can take advantage of this special offer during the months of May, June, and July only. See your Arvin jobber right away.



**THIS IS THE  
CHAIR YOU  
GET**

This attractive all-metal chair is a new Arvin product. Hundreds of thousands have been bought by retailers all over the country. You can get one or two of these fine chairs for your service station FREE. See your Arvin jobber about the "Early Bird" Deal.

*Hot New Set-up*



*of Sales Helps, too!*

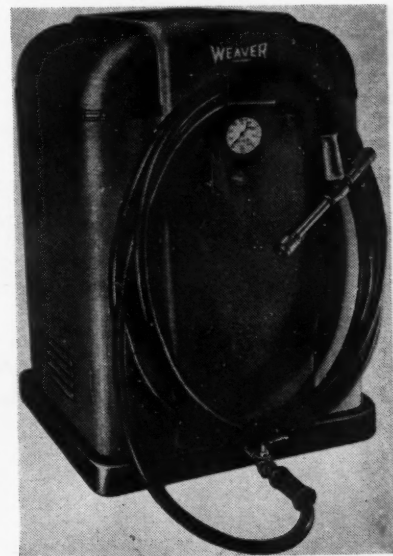


## Engine Valve Spring Pressures—Cont.

MAKE AND MODEL OF CAR		VALVE SPRINGS			
		VALVE OPEN		VALVE CLOSED	
		Pressure (Aver.) Pounds	Length Inches	Pressure (Aver.) Pounds	Length Inches
		Year			
<b>NASH—Continued</b>					
3820	(Inner)	1938	52	1 1/2	22
3820	(Outer)	1938	96	1 1/2	40
3880	(Inner)	1938	52	1 1/2	22
3880	(Outer)	1938	96	1 1/2	40
3880		1938	117	1 1/2	69
La Fayette-3810		1939	114 1/2	1.687	67 1/2
La Fayette-3910		1940	115	1.687	70
La Fayette-4010	(Outer)	1940	95	1.343	38
4020, 4080	(Inner)	1940	51	1 1/2	21
<b>OLDSMOBILE</b>					
F32, L32, F33, L33, L34		1932-34	96	1 1/2	43
F34		1934	101	1 1/2	56
F35, L35, F36, L36		1935	116	1 1/2	43
F37, L37		1937	94	1 1/2	48
F38, L38		1938	95 1/2	1 1/2	50 1/2
60, 70		1939-40	95 1/2	1.937	50 1/2
80		1939-40	94	1.968	46
<b>OVERLAND</b>					
		1939	100	1.814	59 1/2
<b>PACKARD</b>					
900 series, 901-902 series, 903-904 series		1932	159	2 1/2	73
905-906 series		1932	145	1 1/2	60
1001-1002 series, 1003-1004 series		1933	159	2 1/2	73
1005-1006 series, 1107-1108 series		1933-34	145	1 1/2	70
110-1101-1102 series, 1103-1104-1105 series		1934	159	2 1/2	73
1200-1201-1202 series, 1203-1204-1205 series		1935	159	2 1/2	73
1207-1208 series, 1407-1408 series		1935-36	145	1 1/2	70
120 series, 120B series, 120C series		1935-37	110	1 1/2	40
1400-1401-1402-1403-1404-1405 series, 1500-1501-1502 series		1936-37	159	2 1/2	73
115C series		1937	110	1 1/2	40
1207-1208 series, 1407-1408 series		1935-36	145	1 1/2	70
120 series, 120B series, 120C series		1935-37	110	1 1/2	40
1400-1401-1402-1403-1404-1405 series, 1500-1501-1502 series		1936-37	159	2 1/2	73
115C series		1937	110	1 1/2	40
1506-1507-1508 series, 1607-1608 series		1937-38	145	1 1/2	70
1600 series, 1601-1602 series		1938	120	1 1/2	50
1603-1604-1605 series		1938	159	2 1/2	73
1700, 1701, 1702		1939	120	1.312	50
1703, 1705		1939	159	73	3.032
1707, 1708		1939	145	1.906	70
1800, 1801		1940	120	50	1.625
1803, 1804, 1805		1940	135	58	1.750
1806, 1807, 1808		1940	135	58	1.750
<b>PIERCE-ARROW</b>					
54, 52, 53		1932	103	1 1/2	53
836, 1236, 1242, 1247, 836A, 840A, 1240A, 1248A		1933-35	123	1 1/2	62
1255, 845, 1245, 1601, 1602, 1603, 1701, 1702, 1703		1935-37	124	1 1/2	63
1801, 1802, 1803		1938	124	1 1/2	63
<b>PLYMOUTH</b>					
PA, PB		1932	69	1 1/2	43
PC		1933	78	1 1/2	42
PD		1933	78	1 1/2	36
PE, PF, PG, PJ, P1, P2, P3, P4, P5, P7, P8, P9, P10		1934-40	80	1 1/2	36
<b>PONTIAC</b>					
402		1932	34	1 1/2	...
302		1932	105	1 1/2	...
601		1933	78	1 1/2	48
603		1934	78	1 1/2	43
701A, 701B, 605, 36-26BA, 36-26BB, 36-26BA		1935-36	82	1 1/2	52
37-26CA, 37-26CA		1937	96	1 1/2	58
38-26DA, 38-26DA		1938	96	1 1/2	55
39-25, 39-26, 39-28		1939	96	1.593	54 1/2
40-25, 40-26, 40-28, 40-29		1940	101	1.593	60
<b>REO</b>					
8-31, 8-35, N-1, N-2		1932-40	85	2 1/2	60
S, 2S, 3S, 4S, 5S, 7S		1932-35	90	2 1/2	59
N-33		1932-33	95	2 1/2	60
6A, 6D		1935-36	140	2 1/2	52
<b>ROCKNE</b>					
65, 75, 10		1932-33	74	1 1/2	51
<b>STUDEBAKER</b>					
6-55		1932	74	1 1/2	51
8-62, 8-71, 6-56, 8-73, 8-82		1932-33	103	1 1/2	62
8-91, 8-92, A, B, C, 1B, 1C		1932-35	103	1 1/2	66
1A, 2A		1935	130	1 1/2	60
3A, 4A, 2C, 5A, 6A, 3C, 7A, 8A, 4C		1936-38	130	1.750	57
5C, 9A, 6C, 10A		1939-40	130	1.343	51
2G		1940	92	1.343	51
<b>STUTZ</b>					
LAA, SV16, CS22		1932-35	102	2 1/2	56
DV32, CD22		1932-35	115	1 1/2	53
<b>TERRAPLANE</b>					
Essex-Terraplane 6, 8		1932-33	102	1 1/2	44
K, KS, KU, G, GU, 61, 62, 70, 71, 72		1934-37	102	1 1/2	2
<b>WILLYS</b>					
97, 98D		1932	...	...	...
6-80, 8-88, 6-90A, 8-88A, 99		1932-33	86	1 1/2	47
77, 77A, 37, 38		1933-38	85 1/2	1.937	46 1/2
39		1939	100	1.814	59
440		1940	100	1.814	59

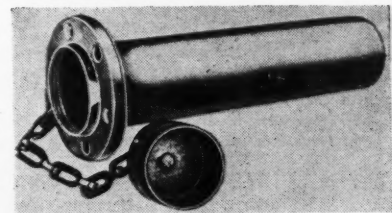
## Weaver Announces Hi-Speed Car Washer

An attractive streamlined hood protects the motor and pump of the new Weaver Hi-Speed car washer from water and dirt. This new washer, just announced by the Weaver Mfg. Co., Springfield, Ill., is powered by a



1 hp. motor, stands only 38 in. high, and delivers 325 lbs. pressure smoothly and quietly. Supplied with 25 ft. of 1/2 in. high-pressure hose.

## Waterproof Container



This device is made of nickel plated brass, and is designed to hold all the necessary license and inspection papers carried by truck operators. Made by Cole-Hersee Co., 54 Old Colony Ave., Boston Mass.



"This year I'd like to take my vacation in advance, boss—starting NOW!"

## Penny Postals for Profits

### This Personalized Direct Mail Scheme Brings Business

By R. C. Grout, Country Club Garage, Denver, Col.

The Country Club Garage is a one stop station in the residential section of a city of 300,000 population, and we have had to find a type of advertising that we can use to tell the car owners in our neighborhood about our service. After trying blotters, neighborhood newspapers, church publications, manufacturer's and oil company's standardized letters and postcards, personal letters and postcards, we feel that the best results for us

have been obtained from personal postcards which we send once or twice a month.

In these cards we write about the things of interest to be seen in drives into the district surrounding Denver. In the spring we tell when and where to see the wild flowers as they come into bloom. In the fall about two cards go out when the fall coloring is at its best. In the winter several cards tell where to see the skiing.

These stories take from a third to half of the space on the card and the

rest of the space is devoted to giving suggestions on necessary car servicing to make the trip a pleasure; also to mentioning accessories and automotive items we have for sale.

The Christmas card we used was made by drawing the design on the stencil and then using brush and red and green ink to do the coloring. It was well worth the time it took to prepare these cards. These Christmas cards we sent only to customers who had given us some business during the last half of the year.

We have a multigraph stamp to print these cards and they are addressed on a second-hand addressograph that we were able to get very cheaply. We cut the stencils on the typewriter and can get 16 lines on a card.

The cost of sending 500 of these cards to a selected list of car owners in our immediate neighborhood is about 40 cents more than the price of the postcards, which are the regular government one-cent cards.

We keep a pictorial botany and photographs at the garage to show when customers ask about some of these interesting things mentioned on our cards.

At the present time we are running a series of cards on SERVICE and are receiving a very favorable response.

### Water Pump Refacing Tool

A tool for refacing the seats of water pumps before installing new seals is being offered the repair trades by distributors of Thompson Products, Inc.

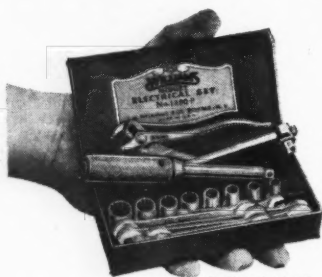
The parts are neatly fitted in a hardwood block, which can be hung on wall or bench by a hanger eye on the back of the block. The tool includes five pilots of varying sizes which screw into a T-handle, two hardened cutters and two emery finishing disks. A flat spring in the top of the block holds all parts in place when not in use.

The tool takes care of many different cars and trucks that use seal-type water pumps, including Ford, Chevrolet, Plymouth, Buick, Dodge, Chrysler, De Soto, Overland, Packard and Lincoln-Zephyr. Net price complete is \$9.

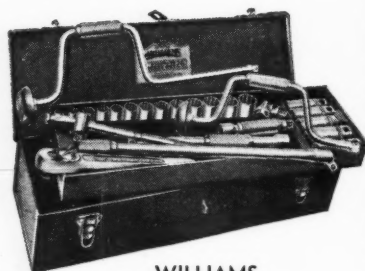


"It's been hovering in front of the car ever since I bought those fog lamps!"

## BREAD WINNERS BOTH!



WILLIAMS  
COMBINATION  
ELECTRICAL SET NO. 1290P



WILLIAMS  
GENERAL SERVICE SET NO. 26

Two new Williams Sets that earn their cost many times over in BETTER JOBS, FASTER JOBS, EASIER JOBS!

"1290P" with 8 Midget "Supersockets" and 10 Midget "Superrenches" makes you master of these troublesome nuts ordinary, awkward tools can't handle. Each "Superrench" has two openings of the same size — but AT DIFFERENT ANGLES. When one opening won't operate — the other will! Parts include 4½" Sliding T Handle; 5⅝" Extension-Driver with revolving lockable grip; "Superplier".

"26" is the garage and service man's standby. Has 18 Standard "Supersockets"; 13 Reg. Straight Wall, 12 Pt. openings 7/16 to 1"; 5 Extra Deep, 12 Pt. openings 11/16 to 1⅝". 8 Drivers, including Reversible "Super-ratchet" and Universal Joint.

See both these trouble-shooting sets at your jobber's!

**WILLIAMS**  
SUPERIOR DROP-FORGED TOOLS

**SUPERSOCKETS • SUPERRENCHES**

J. H. WILLIAMS & CO. — "The Wrench People"

225 Lafayette Street New York, N. Y.

Western Warehouse & Sales Office: Chicago — Works: Buffalo



# THE 7 BIG FEATURES OF CoMAX BRAKE LINING WILL WIN THE FAVOR OF YOUR CUSTOMERS



for Quick, Safe, Smooth Stops

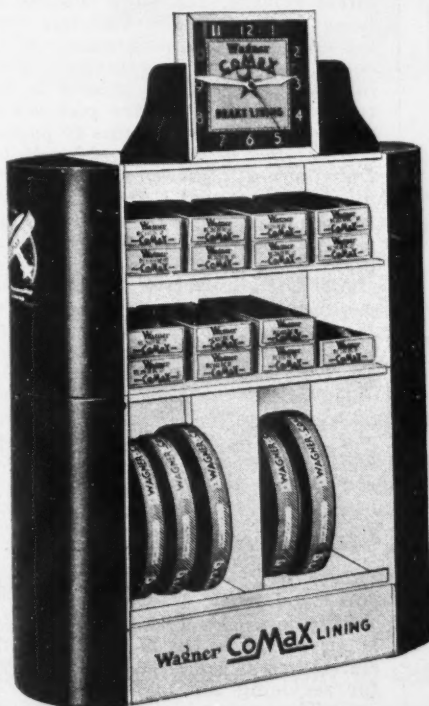
We Recommend **Wagner**

## CoMAX

### BRAKE LINING

- 1. Homogeneous**  
Uniform in texture throughout. As the lining wears, the same type of brake surface is always exposed to the drum.
- 2. Non-Compressible**  
Does not "squash out" under brake pressure. Brakes lined with Wagner CoMAX run for long intervals without needing adjustment.
- 3. Easy on Drums**  
Contains no abrasive material.
- 4. Ideal for High Speeds**  
Maintains its performance under severe braking action.
- 5. Quiet**  
Grips silently. No "howling" or "squealing."
- 6. Smooth**  
Uniform friction permits even, controllable deceleration.
- 7. Age-Proof**  
Does not deteriorate with age.

IN SETS, ROLLS AND BLOCKS



FL-1012C CABINET and ASSORTMENT includes 5 rolls of CoMAX and 15 drilled car sets... Trade net, including cabinet and electric clock, \$99.60... Same, but with metal sign instead of clock, \$98.02.

The outstanding features of CoMAX appeal to owners of cars and trucks, and the dependable performance of this brake lining creates customer satisfaction and builds goodwill.

The seven big features of CoMAX are in themselves sufficient reason to justify your featuring this quality product. But behind the product is a manufacturer whose research and experience in brakes is further assurance that when you follow CoMAX specifications you are supplying the right lining for the job.

Wagner *knows* brakes. As manufacturer of Lockheed Hydraulic Brakes, Wagner has a valuable background of experience in braking problems which dates back sixteen years. In addition to the data gathered by the great scientific laboratory at the Wagner factory, this experience is supplemented by the field work of Wagner's own factory-trained service men operating out of 25 strategically located Wagner branches. This field organization consisting of 25 branches, plus the factory laboratory, gives Wagner 26 *PROVING GROUNDS*—and the benefits of this work are passed on to you through Wagner brake service recommendations and other literature which is yours for the asking.

To help you build a profitable business on CoMAX, your Wagner jobber offers a choice of four different CoMAX Brake Lining Assortments and Cabinets. As your business grows you can add one or more units. Cabinets are made of steel, and sections fit on top of one another... One of the combinations is shown at left... Ask your jobber for details, or write us.

**Clip and Mail Coupon TODAY!**

**GET  
SERVICE  
MANUAL  
and CAP  
FREE**

**AUTOMOTIVE PARTS DIVISION B40-3 MA**  
**Wagner Electric Corporation**

6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

Send Catalog No. BU-43 and service cap FREE...  
Also send complete information on Wagner CoMAX.

FIRM NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_

MY JOBBER IS \_\_\_\_\_

## Merchandising Aids

(Continued from page 37)

RAMCO 10,000-Mile Guarantee." The RAMCO Guarantee Plan which covers both ring replacement and labor charges has now been in operation some two years. The decal is 9 in. by 12 in. and is printed in gold, blue, orange and white. It is available to authorized dealers. For details of the plan address the Ramsey Accessories Mfg. Corp., 3700 Forest Park Blvd., St. Louis, Mo.

The 1940 edition of the Grey-Rock brake-balancing Wall Chart contains

a 12-page introduction that explains, "in words of one syllable," all the steps that are necessary to do a thorough job of balancing or relining a set of modern brakes.

"What the average motorist knows about the complicated brake mechanism of a modern automobile could be written on the back of a postage stamp," says Franklin A. Miller, Grey-Rock's Replacement Sales Manager. "The introductory pages of our new Wall Chart tell him, in language he can understand, just how the system works, how complicated and delicate it is and how painstaking is the job of keeping that system in perfect balance."

The Grey-Rock Wall Chart is part of a colorful wall display that sells the shop's ability to balance brakes. It is intended that motorists, while waiting for service on their cars, will read over the introductory pages which are entitled "The Power Beyond Your Brake Pedal," and thus gain an appreciation of what the mechanic has to do to balance brakes. It can also be used as an answer to customers who, not having read this story, complain about the cost of a brake servicing or brake relining job. Grey-Rock has reprinted these 12 pages in pocket size booklet form, available to the service station, imprinted, for distribution to customers, at \$1 per hundred.



New UNDER-SEAT  
MODELS ADD NEW  
PROFIT POSSIBILITIES  
TO A LINE THAT  
IS ALWAYS A  
MONEY MAKER

Look to

● Under-seat heating by HaDees? Right! . . . And how car owners are going for it! They like the idea at a glance . . . they buy . . . they spread the good word. And what a market! All the thousands of cars, new and old, with under-seat passage front to rear, can be easily and quickly equipped with this newest HaDees sales sensation. Two models—popularly priced to beat down sales resistance. Look at the HaDees line of smartly styled leaders for every purse and purpose—backed by a brilliant array of selling helps. Write for details of latest profit-proposition NOW.

LIBERTY FOUNDRIES COMPANY  
ROCKFORD, ILLINOIS  
Division of Burd Piston Ring Company

HaDees

FOR THE LATEST IN FULL CAR COMFORT

Auto-Lite is launching an intensive merchandising drive to benefit individual dealers in their own neighborhoods, according to W. E. Blank, sales manager. This localized effort will be keyed to a four-season promotion plan to stimulate spring and summer battery sales, thus leveling out, to some extent, the business peaks occurring in the fall and winter months. In addition to the usual point-of-sale material furnished to dealers, Auto-Lite's program includes direct-mail, window trims, posters, counter cards and banners designed with a specific seasonal appeal. Each of the four merchandising kits calls attention to services offered by the dealer other than those pertaining to batteries. The complete campaign is sent direct to dealers without charge, upon recommendation by Auto-Lite Battery distributors.

The sixth edition of the Delco-Remy DR-324 Operation and Maintenance handbook has just been released. This latest revised, 144 page edition, contains factory service bulletins covering operation and maintenance of Delco-Remy electrical equipment, including the 1940 equipment and is illustrated by more than 200 pictures and diagrams. It also contains 27 pages of test specifications on Cranking Motors, Distributors, Generators, and Regulators. Current and Voltage Regulation is fully discussed, both as to operation and methods of checking and adjusting. Every electrical service man and student of automotive electrical equipment will find this handbook an authentic source of service information on Delco-Remy electrical equipment. The handbook has been made available through the Delco-Remy field service organization, United Motors Service, 3044 W. Grand Boulevard, Detroit, Michigan. The price is \$1.00.

## Clutch and Brake Pedal

### Return Spring

The newest member of the Champ Items family is the No. 981 universal clutch and brake pedal return spring for servicing all 1937 to 1940 Ford cars. The spring is used in its original length for the later model cars, and for early models it is cut to the desired length. The hook can be formed to attain the proper tension. List price \$.15. Champ Items, Inc., St. Louis, Mo.



# U.S.

## LEADS IN

# *Performance*

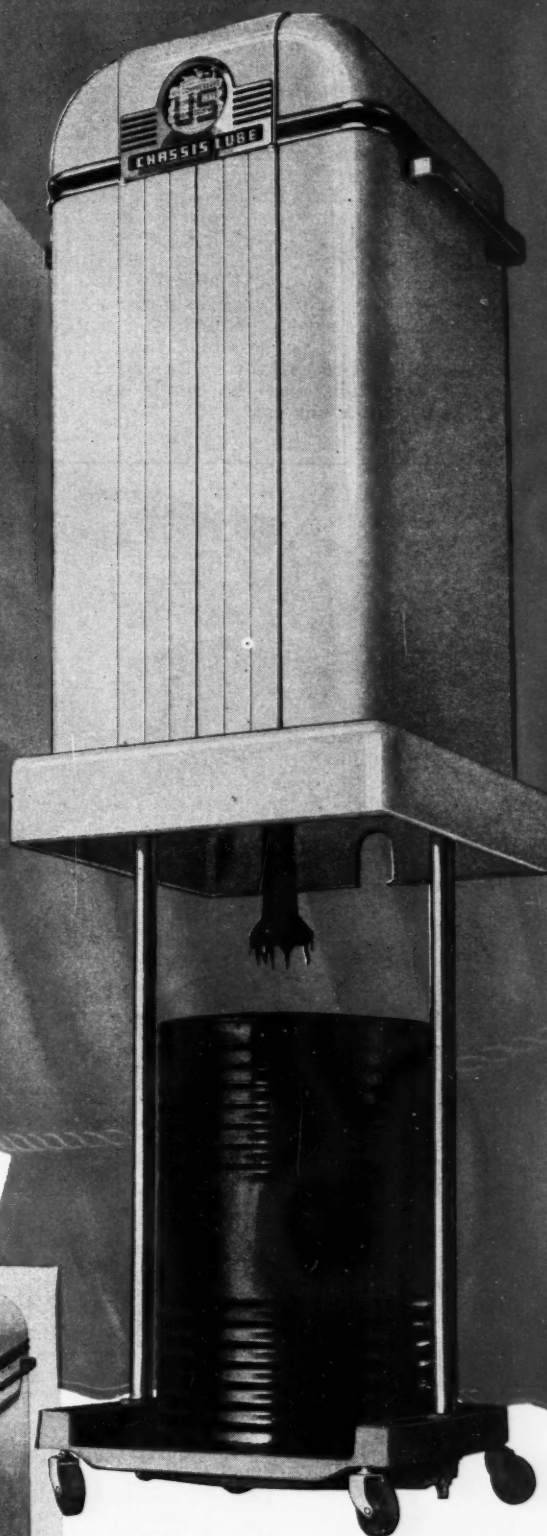
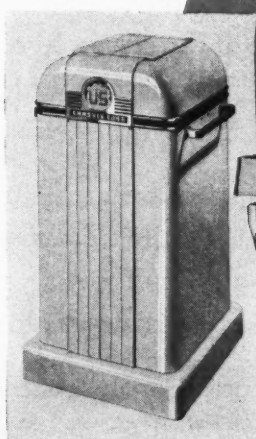


U. S. De Luxe Air Clippers with their remarkable Jack-in-the-box covers (patented) have set a new standard in lubrication plus a new high in values. Changing grease drums is as easy for the attendant as changing hats.

A beautiful unit which not only has eye appeal but turns in the finest performance. The customer can readily see that his car is getting a thorough but gentle "going over" minus the usual bar jolting, pounding and smearing of car.

It makes lubrication much easier, faster and cleaner for attendant.

U. S. Leadership is a plain statement of a stubborn fact—you can't buy another lubricating unit on the market that compares with U. S. De Luxe Air Clippers, in looks, action or price.



Merely insert air hose in the base of unit and the entire cabinet including outside base, suction pipe, pump and hose is elevated on two air pistons. Just slide out one drum and slip in the other, a matter of a few seconds.

**THERE IS ONLY ONE EASY WAY TO CHANGE GREASE DRUMS—THE U. S. WAY... TRY 'EM ALL AND BE CONVINCED.**

# THE U. S. AIR COMPRESSOR COMPANY

Cleveland, Ohio, U.S.A.

Air Compressors

Greasing Equipment

Hydraulic Lifts

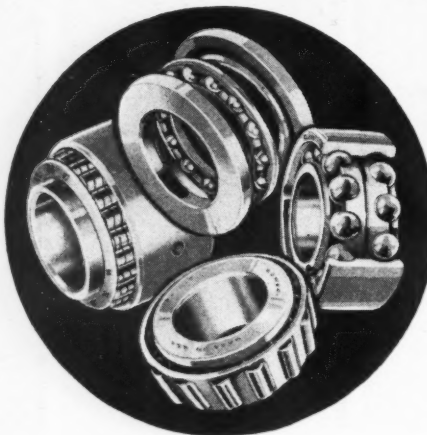
## Boosting the Bills With Credit

### A Sound Credit System Keeps This Shop Busy

When business slacked up in 1930 after the collapse of 1929, C. D. Rutledge, owner of the Lone Star Garage, San Antonio, Tex., decided that he would offer credit to reliable customers in order to get more general repairing work as well as body work.

He launched a plan whereby he would give credit on work to persons whose cars were clear of debt, and in return for the work, he would take a mortgage on the car for the amount of the bill, financing the whole arrangement at 8 per cent.

"This idea has worked out so well," declares Mr. Rutledge, "that it has kept our shop of six men busy for many years. We never seem to have any slow periods. In fact we always have enough work to keep us busy, and I have found a large number of people willing to have repair work done if they are given time to pay. When I get a mortgage on a fellow's car, then I am taking no risk in putting in time and money repairing his car or doing a lot of body work. This arrangement has worked out well."



**THIS POOR CAR** is trying to make itself feel better through the power of suggestion. As a matter of fact the only thing that will bring it back to lively health is having its rough, worn bearings replaced.

One worn bearing can give an otherwise perfect overhaul job the "colly-wabbles," so it's a good idea to sell every customer on the importance of bearing replacement.

Every type and size of bearing you need to do the job right will be promptly supplied by your *Authorized Ahlberg Jobber*.

Get every type of Bearing you need—when you need it—from your **AHLBERG** jobber.



**Ahlberg Bearing Company**

Manufacturers of C&B Master Ball Bearings  
3025 WEST 47TH STREET — CHICAGO — 34 WAREHOUSE BRANCHES  
Out West 10 PRECISION BEARINGS, INC. Los Angeles

Mr. Rutledge points out that many times a man will bring his car into the Lone Star Garage and want a valve grind job. When this is done, the garagemen may find that the piston rings need replacing. If the car owner can have time to pay for this work, he perhaps will order it done, and other work as well.

"On a lot of jobs where the original amount the man intended to spend ranges around \$10, we are often able to get \$50 and \$60 worth of work from him," declares Rutledge. "Most cars two to three years old are in need of a little body work and a paint job in addition to some motor overhaul. Through our credit plan, we have been able to sell a high percentage of paint jobs along with motor repairs. In fact, our paint department is one of our most profitable, because we are always busy."

Mr. Rutledge also gets quite a few orders from various trucking concerns to paint trucks, for which he charges \$25 each, although many concerns in San Antonio will paint trucks for 40 per cent less. Nevertheless the Lone Star Garage has a fine reputation for turning out good paint jobs, and that's why big truck companies send their work here.

"While we try to hold our average credit customer to pay in five months' time," states Mr. Rutledge, "we frequently give some reliable customers a whole year to pay. I can take my paper to the bank, discount it, and then be assured I can continue to extend credit to new accounts. Customers can either make weekly, monthly or full term payments, whichever way they like, although the mortgage is not clear of course until the whole amount is paid."

Rutledge points out that many of his customers come to his garage from great distances, which shows that they appreciate a credit account on garage work.

"A major bit of motor overhaul and body work will frequently run from \$50 and upwards," states Rutledge. "This is a big amount for the average man to pay in cash. Now, suppose, you can sell the man another \$50 worth of work and give him credit on the work, getting a mortgage on his car to secure your claim, and when you can discount your paper, you will eventually be money ahead."

Rutledge says that he does not advertise his credit plan in newspapers or by direct mail. However, he does have a large sign above his garage which has this copy:

"Your credit is good," "Motors reconditioned, auto painting, seat covers, tops, body and fender work. Tires and tubes. Five months to pay."

This sign, plus the recommendations which satisfied customers make to their friends, gives Rutledge and his men all the work they can handle.

### New Transportation Show at New York World's Fair

The largest brand-new exhibit yet added to the World's Fair of 1940 in New York will be a mammoth national highway transportation show covering 30,000 sq. ft. alongside the Maritime, Transport and Communication (Continued on page 55)



# ANYBODY WHO CAN TAKE PICTURES



*...won't have a bit of trouble understanding the facts about car performance*

PEOPLE don't have much trouble figuring out the gadgets on their cameras. Nor will they have any difficulty catching on to the simple, but important rules of car performance.

The important facts are shown on the chart at the right.

Get these simple facts across to your customers and you'll be able to do better tune-up work because you won't have to retard the spark to allow for low quality gasoline. You'll hear fewer complaints about "knock" or "ping." And in the long run your customers will be more satisfied with their cars—and with you.

**ETHYL GASOLINE CORPORATION**, manufacturer of anti-knock fluids used by oil companies to improve gasoline

MOTOR AGE, May, 1940

*When writing to advertisers please mention Motor Age*

51



**THE HIGHER THE  
ANTI-KNOCK QUALITY  
OF GASOLINE . . .**



**THE FARTHER YOU CAN  
ADVANCE THE SPARK TOWARD  
MAXIMUM POWER  
(without knock or ping)**



**AND THE BETTER  
THE PERFORMANCE  
OF THE CAR**

---

**HERE ARE THE SIGNS OF IMPROVED GASOLINE**



**BETTER**—This sign on a pump means that lead (tetraethyl), a liquid, has been added to the gasoline to improve its anti-knock quality. More than three-fourths of all the motor fuel sold today in the United States and Canada is "leaded" gasoline.



**BEST**—The "Ethyl" emblem means that: The gasoline contains enough lead (tetraethyl) for highest anti-knock, is a dealer's finest motor fuel and the engine's spark can be advanced closest to the point of maximum power and economy.

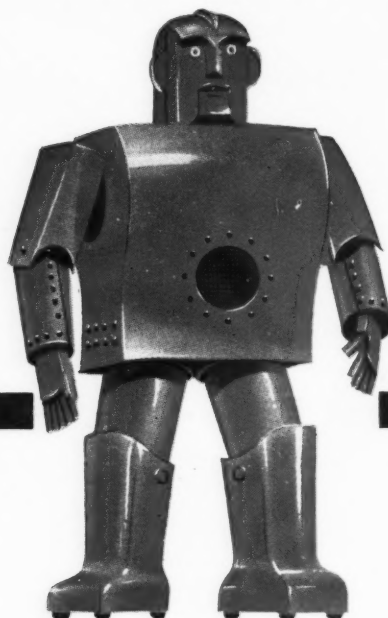
**THE BETTER THE GAS—THE BETTER THE CAR**

**TUNE IN EVERY MONDAY NIGHT**—Tony Martin, Andre Kostelanetz and his orchestra, featured on "Tune-Up Time" over coast-to-coast network, Columbia Broadcasting System.



**an  
Old Metal**

**goes  
Modern**



**O**F THE recent metallurgical developments at the Ford Rouge Plant, the most interesting and far-reaching is the progress made with cast steel.

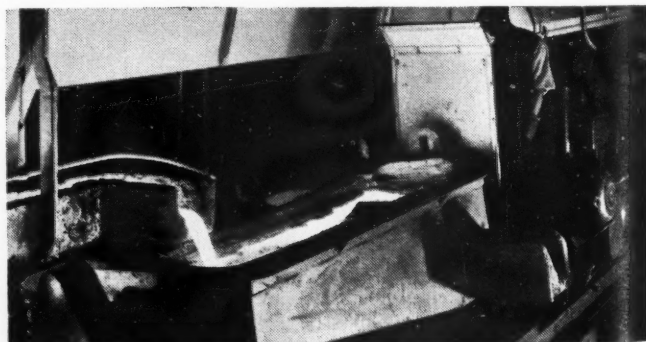
Cast steel, as the 17-acre Rouge foundry knows it, is far different from the cast steel that engineers used to know. A high degree of specialization has been reached. Formulas differ for various parts. And improvements in casting methods are equally important. A complete steel foundry within the main foundry has just been installed for casting these steels by the continuous process.

One by one, new cast steel parts have been introduced — crankshaft, pistons, centrifugally cast ring gears, transmission cluster gears and others.

These modern steels differ from ordinary cast steel in content and heat treatment. They are stronger, more uniform in quality. Where they replace forgings, they are at least as strong in every case — usually stronger. Their performance in actual service has

proved superior. They permit simplification in design. They make better, lighter parts — often at lower cost. That's why it pays to use Genuine Ford Parts.

**FORD MOTOR COMPANY**  
SERVICE DEPARTMENT      DEARBORN, MICHIGAN

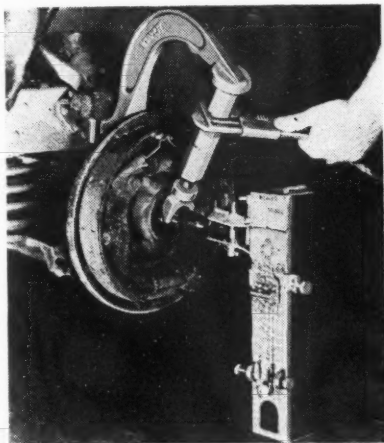


This ladle car travels back and forth on a track pouring molten metal into flasks to make engine castings. The flasks move along on a synchronized conveyor.



## Camber Corrector

One of the latest products of the Weaver Mfg. Co., Springfield, Ill., is a knee-action camber corrector. It consists of a heavy clamp which fits over the steering knuckle support arm (of coil spring knee action construction) and either a screw-type jack or the Weaver front end service hydraulic jack. With a camber gage sus-



pended by a clamp from the end of the spindle, correction can be made for a bent steering knuckle support arm without disconnecting the brake tubing or disturbing the brake adjustment.

## Kralinator Oil Conditioner

Announcement of the addition of a new popular price Kralinator oil conditioner for passenger cars has been made by Olixir Products Co., 887 Niagara St., Buffalo, N. Y. The new



model K-1 Kralinator lists at \$3.50, with a 60-cent replaceable cartridge type conditioning element. It follows the same design as the complete line of larger sizes for truck, tractor and industrial use.

## Transportation Show

(Continued from page 50)

tions Building, Harvey D. Gibson, chairman of the Fair's board, has announced.

Twenty firms will display more than 60 truck models in the vast outdoor arena. Macadam will be laid for an exhibit base along the Fair's Main

Street and a huge canopy will cover the show. An additional 2000 sq. ft. within the Maritime, Transport and Communications Building will be devoted to booth exhibits for accessory manufacturers, meeting rooms and lounges.

The largest truck in the world, a Goliath longer than a freight car, so big that it cannot be driven on a public highway, may be displayed by Mack International, said E. M. Post, Jr., vice-president. The behemoth is 13 ft. wide, 58 ft. long and rolls smoothly along on 18 tires. Used exclusively for strip-coal mining, the truck has a capacity of 45 tons. A little one-ton Mack, tiny progeny of this gargantua, will strikingly illustrate

the wide physical variety in the current truck field.

A fire pumper for small communities capable of pumping 150 to 300 gal. a min. will show how to obtain "fire protection at reasonable prices" and a school bus designed to be the "ultimate in safety" will be among other Mack exhibits, said Mr. Post.

Other participating firms will exhibit their latest models—revealing the tremendous improvements that have been made in this vital phase of the automotive industry. One section of the display will be devoted to the part trucks play in the everyday life of a metropolis, running the gamut from street-cleaners to police "Black Marias."

## RING SPECIALISTS DEPEND ON WEL-EVER



"I  
**MUST**  
Have  
Satisfied  
Customers  
—so I  
recommend

## "Drān-Bac 'H' Sets"

WELCO  
Comp.

Multi  
Comp.

Drān-Bac  
Oil

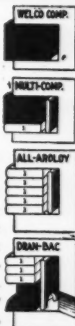
Bevl-Chanl  
Oil

"H" Sets are DEPENDABLE SETS! Each ring engineered for its own special ring groove... individualized to the piston and the motor! "H" Sets are full of LIFE! The flexible Drān-Bac Oil Ring assures plenty of oil economy while the Multi-Compression ring packs pep and power into every cylinder! "H" Sets actually

Stay  
Young  
Longer

For  
Severely  
Worn  
Jobs

We recom-  
mend our  
"D" Super  
Set where  
car - owner  
will not  
have re-  
bore job.  
Rings for  
all grooves.



Licensed  
under  
patent 2148997

For  
Re-Bore  
Jobs

We suggest our "BW"  
Set where customer in-  
sists on 1-piece rings  
for re-bore jobs. Rings  
for all grooves.



jobs you get... but that isn't all. "H" Sets permit generous cylinder wall lubrication and actually s-l-o-w-d-o-w-n cylinder wall wear! "H" Sets have rings for all grooves and each ring is WELCO-finished.

Long manufacturing experience builds dependability. Wel-Ever Sets have that dependability... ever since 1918!

**Write or Wire Today for Proposition**

Your territory may be open

**WEL-EVER**

TRADE MARK

REGISTERED

THE  
**WEL-EVER**  
Piston Ring Co.  
TOLEDO, OHIO

## Buick Starter

(Continued from page 17)

(d) Connect voltmeter leads to relay terminals.

(e) Move rheostat slowly, decreasing resistance until engine starts to crank. This indicates the "cutting in" of the relay without removing the cover. The voltage required should not be higher than 1.9 volts.

(a) Continue to adjust rheostat until all resistance is cut out so that full voltage is applied to the relay. This fully saturates the magnet core.

(b) Gradually increase resistance until starter discontinues cranking.

Voltage indicated at this instant will be that required for the relay points to open, which should be 1.0 to 1.2 volts.

If relay does not operate within voltage limits specified above, the adjustment should be carefully checked. Point opening should measure between .025 in. and .045 in.; the air gap between the armature and pole of magnet coil should measure .010 in. to .013 in. with the points closed.

The air gap can be varied by moving armature up or down after loosening the air gap adjustment screws. The point opening can be varied by bending point gap adjustment stop.

After the point and air gap adjustments have been corrected, it may be

necessary to also regulate the spring tension, which can be done by bending the tension spring seat up or down until the relay operates within the prescribed voltage limits.

If it is necessary to remove the solenoid for repairs, starter assembly should be removed because it is important to see that the pinion travel is properly adjusted when the solenoid is reinstalled.

Remove pin "A" and push solenoid plunger all the way forward. Take lash out of the shift mechanism by pressing finger on the clutch shell. Adjust stud "B" until pin "A" can just be inserted at the forward end of the slot with pinion  $\frac{1}{8}$  in. from housing.

The torsional return spring tension on the shift lever pivot, measured at "A," should be as follows:

Start of travel... 9 to 12 lbs.

End of travel... 28 to 35 lbs.

A weak return spring may cause the pinion disengagement to be sluggish in cold weather particularly if the shaft is gummed up.

### Vacuum Switch

The vacuum switch is mounted on the throttle body by two screws located underneath the cover plate. A gasket is used between the switch and the throttle body to seal against loss of vacuum. The switch is operated by the throttle shaft and engine vacuum.

The diaphragm is located at the top of the assembly and held in place by a die-cast cover which is screwed to switch housing. This cover also forms the vacuum chamber and positions the diaphragm return spring. The purpose of the diaphragm is to operate the Guide Pin Lock-Out which prevents the contacts from closing when the engine is running with the throttle open. The electrical circuit is opened and closed by means of a Contact Rotor on the Throttle Shaft and two Contact Springs one of which is combined with the Lock-Out Lever.

In wiring switch always connect the wire having red crossing tracers to the terminal on front of switch. This is the "hot" wire and when so connected protects Lock-Out Lever from being accidentally short-circuited if it is bent back against the housing during the timing operation.

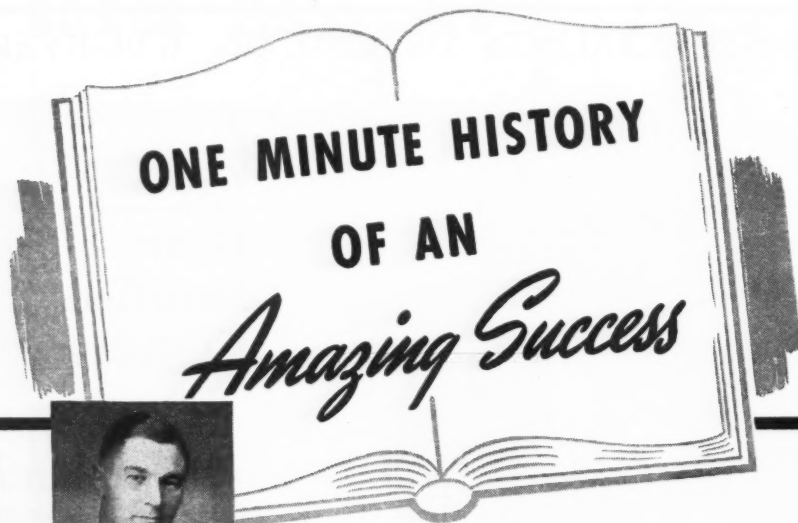
The new switch requires no timing other than to compensate for manufacturing tolerances in switch, rotor, and throttle shaft. This is taken care of by the use of special timing washers. These washers vary the position of the rotor on the throttle shaft, hence establish relationship of throttle shaft and lock-out lever.

The washers are numbered, each number representing a difference of three angular degrees in throttle shaft rotation.

Should any of the parts affecting this assembly be replaced, it will be necessary to check the timing and possibly substitute one of the other washers to obtain the desired limits.

Less clearance than  $\frac{3}{64}$  in. may result in failure to establish contact in cold weather. More clearance than  $\frac{3}{32}$  in. may result in clashing of gears during acceleration at low speed. To adjust vacuum switch:

1. Set idle adjusting screw for 8 m.p.h. (Hot idle.)



In 1936, Car Dealer John Kovacs of Schenectady, N. Y., wrote—

"We feel certain that our sales will total approximately seventy barrels for the calendar year as against an amount considerably less, even with the lower priced oil which we originally handled." Those were his comments when he took on the line.

### NOW HE'S BUYING BY THE CARLOAD!

Here's what he says in April, 1939... "Ship immediately one full carload Valvoline Motor Oil."

Mr. Kovacs' success is being repeated by many thousands of dealers everywhere. And no wonder—Valvoline, leading independent producer for 74 years, has a product that gives sensational performance, and a tested sales plan that gets results. Write for details "I Dare You" plan today.

VALVOLINE OIL CO. • Offices: 540 East 5th Street, Cincinnati, Ohio • Refinery at Butler, Pa.

# VALVOLINE

THE ORIGINAL PENNSYLVANIA OIL





2. Remove switch cover plate and gasket. Place mirror so that guide pin and lock-out is visible from left side of car.

3. Start engine and pull out hand throttle until clearance between idle screw and cold idle cam, when cam is held in fast idle position, is approximately  $\frac{1}{4}$  in.

4. Shut off engine.

5. Slowly close throttle by tapping lightly on hand throttle lever until guide pin and lock-out releases.

6. With throttle in this position, measure the clearance between idle screw and cold idle cam when cam is held in fast idle position. This clearance should not be less than  $\frac{3}{64}$  in. or more than  $\frac{3}{32}$  in.

If clearance is less than  $\frac{3}{64}$  in., replace timing washer with a higher numbered washer. If more than  $\frac{3}{32}$  in., replace washer with one having a lower number. Always re-check timing after replacing washers.

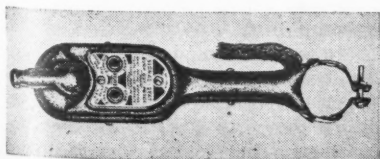
### Hall Announces Range of Valve Guide Reamers



The Hall Mfg. Co., 1600 Woolland Ave., Toledo, Ohio, has announced a new counter display card on which are displayed a line of valve guide cleaners ranging in size from  $\frac{5}{16}$  in. to  $\frac{7}{16}$  in., priced at \$1.25, and from  $\frac{7}{16}$  in. to  $\frac{1}{2}$  in., priced at \$1.50. Reamer blades are reversible, and are easily replaced at low cost, the manufacturer states. The company has announced that it will shortly have the same type of multiple blade reamer available for Ford 60 and 85 h.p. models.

### Directional Signal

Signal-Stat is the name of the new directional signal introduced by the Signal-Stat Corp., 59-79 Pearl St., Brooklyn, N. Y. New features claimed for this light are a new burn-out proof switch which is guaranteed by



the manufacturer not to burn out no matter how long the signals stay lit; the fact that this switch can be installed with any make of directional signal with which the vehicle may be equipped, and the use of two pilot lights to indicate failure of front or rear signals.

### Varnish

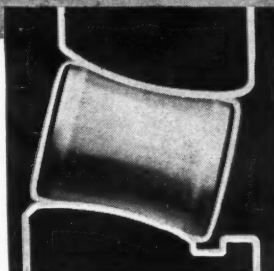
(Continued from page 32)

can also be attacked at the same time that this upper cylinder treatment is being done. It is easily accomplished by the use of the correct amount of solvent in the crankcase and an aeration rod. This very simple device con-

sists of a small tube, plugged and drilled with small holes on one end and fitted with a  $\frac{1}{4}$ -in. pipe connection at the other. This, when connected to a suitable air supply and inserted into the crankcase through the bayonet gage hole or oil fill pipe will agitate the combined motor oil and solvent throughout the entire crankcase. This operation when extended for a period of 10 to 15 minutes, attacks gums, tars, sludge, etc., in the crankcase. Naturally, this mess should be drained from the engine immediately, and the engine should be flushed with a good grade of flushing oil, again using the aeration rod for best results.

## LOOK AT THIS BEARING!

EXCLUSIVE CONCAVE-CONVEX  
ROLLER DESIGN STEPS-UP  
LOAD-CARRYING AND RADIAL-  
THRUST CAPACITY!



### PERFECT FOR REPLACEMENT...

Front Wheel . . . Rear Axle . . . Differential

Here's the kind of bearing you want—designed for positive, full-contact alignment and able to carry extra radial-thrust loads. It has that plus capacity that assures top performance and makes long life certain. Protect your reputation for doing good work by using Link-Belt Shafer Roller Bearings in your replacement jobs. Ask your jobber about this better bearing today!

**LINK-BELT COMPANY**  
519 N. Holmes Ave., Indianapolis, Ind.  
Warehouses in all principal trading centers



## LINK-BELT SHAFER ROLLER BEARINGS

# LEGALLY SPEAKING

by C. R. ROSENBERG, JR.

**A lawyer's interpretation of Federal and local court decisions of interest to repairmen, presented each month**

## Just A Personal Matter

ONE of the things an employer does *not* have to pay for, says the Supreme Court of North Carolina, is a "personal" fight between an employe and a customer.

A customer in a North Carolina store did not like the way one of the men clerks spoke to a girl working in the store office.

"You are no gentleman or you wouldn't talk to her that way," said the customer to the clerk.

"I'll do you worse than that," retorted the clerk. "Come this way." So they fought it out with their fists in an alleyway near the store.

Later came the customer's suit against the store for financial redress for the injuries sustained in the fight. It was urged that the store, as the clerk's employer, was liable because the clerk had inflicted injuries "in the course of his employment."

But the court couldn't see it that way. At the trial of the case the customer admitted that his conversation with the clerk was not about the business of the clerk's employer but was a "personal matter" between him and the clerk.

"When the customer went out of his way to reprimand the clerk for his manner of speech," said the court, "he fell under the proverbial comparison of 'He that passeth by and meddleth with strife belonging not to him, is like one that taketh a dog by the ears. Prov. 26:17.'"

So, for once an employer did not have to pay, because the fight arose over an admittedly "personal matter."

## Can't Get Back Over-Payment

IF, because of a mistake of fact, a repairman pays money he doesn't owe, ordinarily the courts will help him get it back. But if he makes such a payment—an over-payment, for instance—without any mistake of fact, the money *stays paid* so far as the law is concerned.

In a recent Federal case a business house entered into a contract whereby certain necessary service was to be furnished by a service organization. Payment was to be in accordance with the amount of service used and at rates set forth in the contract.

The monthly invoices rendered by the service organization, it was claimed, were for amounts considerably in excess of the contract rates. Each time such an "excess" invoice was received, the business house protested the alleged overcharge and was informed that if the invoice was not paid the service would be stopped. As the business house could not operate without the service, it paid the "excess" invoices and thereafter brought suit to get back the alleged overcharges it had thus paid.

Here's how the Federal court figured it:

"The complaint is essentially one for the recovery of excess payments of money to the defendant. These payments appear to have been made voluntarily. Monies paid voluntarily without mistake of fact or in the absence of fraud, duress or coercion cannot be recovered. No basis for relief by way of accounting appears in this complaint."

There was no "mistake of fact" because the business house *knew* it was making over-payments—money that it didn't owe. Because it did not refuse to pay the excess charges and



"Imagine! ME  
Interested In A  
HEADLIGHT  
TESTER!"

"Even if he is my husband, I must say Joe is a plenty smart operator! When he first heard about the new 1940 Sealed Beam Headlights he said, 'Listen, Sugar, there's going to be plenty more headlight testing business from now on and I'm going to get in on the ground floor. We're going shopping for a headlight tester!'"

"That's Joe! Whenever he buys shop equipment he takes me with him—He claims that if I can understand how equipment operates any car owner will be able to see the benefits he will get from a repair job."

"We looked over all kinds. It didn't take me long to decide on the new Bear '555'! The original cost was so low that Joe paid for it right then and learned how to operate it in a few minutes. In fact, it's so easy I can do it myself."

"This new Bear '555' really turns out the jobs in our shop! It checks lateral aim, beam elevation and light volume in just a few minutes. It makes extra bulb sales, gets extra service work and increases fuel and parts sales."

"I haven't told Joe yet that one reason I selected the Bear '555' is Bear's National Advertising in TIME Magazine! I was smart on that count, too! Joe tells me plenty of car owners mention Bear advertising when they drive in." BEAR MFG. CO., Rock Island, Ill.



## NEW BEAR "555" HEADLIGHT TESTER

**AGAIN** For the 11th Consecutive Year Bear Equipment is Official At the Indianapolis Race!





thus risk the stoppage of service essential to its business, the overpayments were "voluntary."

### Contract By Fraud

ORDINARILY, a repairman is bound by a written contract which he has signed, even where the terms of the written contract do not agree with the promises made to him by the other party or—more often—by the other party's salesman. To exclude arguments about salesmen's promises, many contract forms include a clause to the effect that "this contract contains all the agreements between the parties."

Under strict rules of evidence the aggrieved repairman cannot even tell the court about the salesman's oral promises of benefits not contained in the signed contract. But an Oklahoma court recently decided that a party to a written contract is not bound by it where it appears that he was fraudulently induced to sign it by oral misrepresentations.

In the Oklahoma case a salesman promised his prospect, orally, a great many things not called for by the written contract and assured him that the contract contained everything the salesman promised. Relying on the salesman's representations, the prospect signed the contract without reading it. Later, when sued on the contract, the customer told the court that the goods failed to contain the features the salesman had promised, although they did conform to the terms of the written contract.

Ruling that the contract was not binding under these circumstances, the court said:

"One who is fraudulently induced to execute a written contract by the oral misrepresentations of the opposite party may show that fact in evidence, even though the written contract contains a recital that all agreements between the parties are contained therein and that there are no verbal agreements at variance therewith.

"A transaction into which one is induced to enter by reliance upon untrue and material representations as to the subject matter, made by an agent entrusted with its preliminary or final negotiations, is subject to be rescinded at the option of the person deceived."

Of course, the courts *should* help the victim of a fraud. But a safer and cheaper plan for the repairman is to read every paper carefully before signing it!

### Tricky Releases

WHEN a repairman releases a debtor he may, under some circumstances, be giving up much more than he intends.

Suppose, for instance, that A, B and C are jointly indebted to the repairman for \$1,000. B comes around, pays \$335, his proportionate share,

and the repairman gives him a release.

He may thereby release A and C, who thereafter may never have to pay him anything. Under the strict rule of common law, a release of one of several joint debtors operates as a release of all the others.

Some courts, however, will construe the release to extend only to the particular debtor released, if that was the true intention.

"Where it clearly appears," said the Supreme Court of Washington recently, "that the releasor intended to release a particular joint debtor only and to retain his rights against the

others, that intent will be given effect."

In some States, the repairman can release one joint debtor without thereby releasing the others if he sets forth in the release of the one that he is reserving his rights against the others.

Safest plan, if the repairman is ready to release one of the joint debtors for his proportionate share of the obligation, is to get a signed statement from the others whereby they agree, for a consideration, that the release of the one debtor shall not

(Continued on page 66)



## Spring is Springtime

and here are the

# DOOR LOCK SPRINGS

## for Speedy Spring Service!



**No. 941**  
For Ford Cars



**No. 942**  
For General Motors Cars



**No. 943—For**  
Chrysler Cars



**No. 945**  
For all cars

Gay colors make finding the right spring for the job easy. A color chart and 36 springs in each assortment—are in big demand. Dealer Price \$1.60



**Refills**



Ideal for used car departments.

ORDER FROM YOUR JOBBER

**CHAMP-ITEMS, INC.**      6191 Maple Ave.      St. Louis, Mo.

Refills to replace faster moving springs. Packed 12 of any one color in box. Dealer cost \$5c

## Wiper

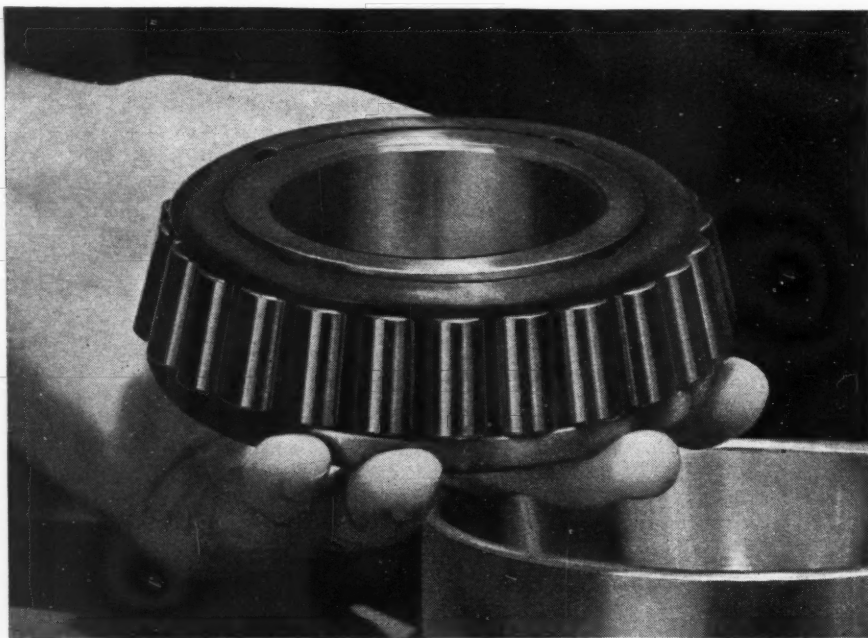
(Continued from page 19)

near the bottom of the windshield where it is out of the way when not in use. Fasten screw securely.

### How to Replace Wiper Transmission Housing

The wiper transmission housing (one for each blade) holds the gearing which transmits the power of the motor to operate the wiper blade and arm. Follow these instructions to remove, repair and adjust the transmission housings:

1. Remove wiper arm. (See Fig. 3.)
2. Remove two lock screws. (See Fig. 4.)
3. Remove bolt holding transmission housing in place. This is the top bolt. Do not disturb bottom nut which is an adjustment nut. (See Fig. 4.)
4. Remove the bolt and bracket. The transmission housing can now be removed.
5. To replace gear assembly, use special spanner wrench No. T-124928.
6. The only adjustment on the transmission housing is to take up any slack in the internal connectors. This is done by holding down the connectors on both sides as shown at "B," Fig. 9, and then tightening lock nut.



## Look at the Bearing that Never Had a Cage Failure

—**AND NEVER CAN**, because there is no cage. Instead  
Tyson fills the cage-space with extra load-carrying rolls.  
More rolls = more capacity, double life, maximum rigidity.  
You'll go farther with Tyson Cageless Bearings.

*Cageless* FOR HARD SERVICE *Cage-type* FOR REGULAR SERVICE

**Tyson**

TYSON ROLLER BEARING CORPORATION, MASSILLON, OHIO

This can be done without spanner wrench operation.

7. Reassemble as shown in Fig. 9.

### Replacement of Fuse

1. The Stewart-Warner Windshield Wiper is protected against electrical overloads or shorting by a fuse. The fuse is located on side of the wiper switch. The fuse is easily removed and replaced. Use 14 amp. S.A.E.

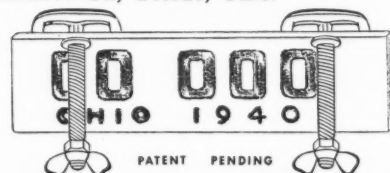
### Replacement of Motor, Dynamic Breaker or Main Gears

To replace the motor, dynamic breaker or main gears, the entire wiper must be removed.

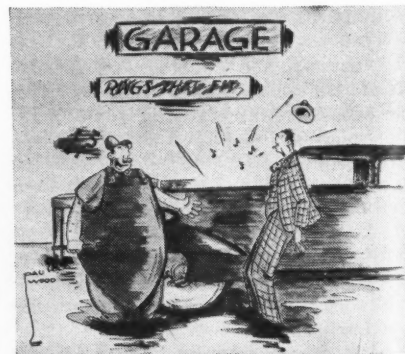
1. Disconnect from transmission housings (see Fig. 4) and remove lock nut holding switch in place See "C," Fig. 10.
  2. Remove control switch knob on dash of automobile.
  3. Remove three screws holding wiper mechanism to brackets.
  4. Disconnect wiring.
  5. To remove dynamic breaker, unscrew all nuts.
  6. Motor can be removed by unscrewing two nuts.
  7. The gear mechanism is held in place by two screws and lock washers.
  8. Reassemble, reversing procedure described above.
  - A. To replace insulator correctly place notch in insulator at bottom of dynamic breaker.
- It is not recommended that the wiper mechanism or transmission housings be torn down any further than shown in these service instructions.

### License Plate Hooks

A new type of hook for dealer license plates which eliminates the necessity of using nuts, bolts and tools is being introduced to automobile dealers under the name "Speed-De," by Advertising Specialties, Inc., 3120 Monroe St., Toledo, Ohio.



By depressing the spring, the plates can be changed from one car to another quickly and without the use of tools. The hooks remain on the license plate when not in use. They are made of cadmium plated steel.



"Do them rings fit? Why every time she inhales it sucks the plugs down two inches!"



## New Edison Cleaner

Edison-Splitdorf Corp., West Orange, N. J., announce a new deluxe



type spark plug cleaner of modern design. It is of all-metal construction, finished in copper-penny and cream, with gun metal fittings to harmonize with any modern service department. The new Edison cleaner is a self-contained portable unit and operates off the air line. Dimensions are 17 1/4 in. high x 7 9/16 in. wide x 6 1/4 in. deep. It is supplied with Edison abrasive and adapters for all sizes of spark plugs.

## A Tourist Service

Dealers and service men are enthusiastic about the new 1940-41 Rand McNally Road Atlas offered in exchange for three box labels by the Burd Piston Ring Co., Rockford, Ill. This 112-page book shows all the highways of every state in the Union and of the Canadian provinces and Mexico. It is 12 x 16 in. in size, and is being given in exchange for three box fronts from Burd "Hi-Speed," or "Super Hi-Speed" combination ring sets, plus 10 cents for postage.

## Accessories

(Continued from page 22)

on some of the newer cars, people have become increasingly aware of the value of air-circulation and will welcome any improvements along that line that you can offer for their not-so-new automobiles. You might also tell them how these fans prevent windows from steaming-up when a summer shower necessitates closing the windows, and they certainly are a boon in stifling summer traffic.

And while we're speaking of cooler and more comfortable driving—there's this question of seat covers. But then, is it a question? Most people are already sold on the value of these covers—especially the women, so there isn't much we need to say about them, save to remind you that they are a good item to push.

There's one awfully useful accessory that is seldom featured in a service station display—and that is extra mirrors. Women seem particularly conscious of the "blind spot" in the car, and yet, rarely seeing these mirrors featured, they don't know about them (or rarely think of them) and go on without them month after month, all the while being completely sold on their value. It would seem to us that such a display, and a verbal follow-up might be well worth while.

When Mrs. Doe, or Sally Jones drives in to have the radiator drained and the car lubricated, that's the time to talk with her about adding accessories. "Miss Jones, how about getting some license tag frames? They

certainly dress up the appearance of your car and they're only 89 cents a pair." You see, Sally has probably seen the frames on a number of cars and thought them quite good-looking. But knowing that they are automotive equipment she figures they'll cost between \$2 and \$3 and that's just too much to spend for a gadget. When you talk with her you not only convince her of the value of the trim, but you break down the price barrier which she has been mentally holding.

The point we're trying to make is that women's training in the wisdom of accessories and their good taste is almost sufficient for the ladies to sell themselves. The barrier lies in price hallucinations, and the fact that they

never think of these things when they are in or near a place where they can be bought.

By that we mean that we are all apt to think of things we could use when we're out driving, but they rarely occur to us when we're in a garage. For example: a number of older cars are not equipped with sun visors. Now the time one is reminded of the value of these is when driving into the late afternoon sun, and then the following week when you're in the garage it's nice and shady and the subject never enters your thinking. A smart garage man that noted a car without sun visors, and who mentions that he has a nice one for less than a dollar might happily find it "sold!"

# "4 STAR" is MODERNIZED Ignition!

**The Custom-Built Line**

*Engineered*

**to compensate for wear!**

**IT'S** logic, clear as crystal, that the Guaranteed "FOUR STAR" line is today's greatest profit opportunity for you! Figure it out: about everything on a car has changed radically, but ignition parts have almost stood still. "FOUR STAR" changes that picture completely—brings ignition up-to-date!

Every "FOUR STAR" part is engineered to compensate for wear! It has that added stamina and heavy-duty capacity which the modern high speed, high compression motors demand. "FOUR STAR", at last, puts ignition performance on a par with the rest of motor progress!

Your car owner is eager for "FOUR STAR" performance with its smoother driving and operating economy—and he's ready to pay for it! Truck, bus and taxi-cab owners—who fix a sharp eye on upkeep costs—regard the "FOUR STAR" line as their lucky star! And it's your lucky star, too! For Guaranteed co-operates with loads of selling ammunition and powerful merchandisers! Ask for detailed information.

● It's easy to stock the quick-turnover "FOUR STAR" Ignition Parts with these compact merchandisers—at a cost surprisingly low. You can get the complete line or any assortment.

**GUARANTEED PARTS CO., Inc. • Seneca Falls, N. Y.**

ORIGINATORS OF THE WELL-KNOWN "FOUR STAR" LINE

## Coatings for Piston Rings

Practically every automobile manufacturer is using coated piston rings at present, and production piston rings are now being supplied by three manufacturers, each using his own coating process. Max M. Roensch of the Chrysler Corp., in a paper presented before the Society of Automotive Engineers, discusses piston ring coatings and their effect on ring and bore wear.

The name Ferrox (the process used for treating one of the three makes of ring used) is derived from ferros-ferric oxide ( $\text{Fe}_2\text{O}_3$ ), the magnetic oxide of iron also known as magnetite. To produce a coating of this oxide on

machined surfaces to the desired depth, the parts are subjected to a temperature of approximately 1000 deg. Fahr. in the presence of a suitable gaseous oxidizing agent in a closed chamber. Iron will form a number of different oxides, and to produce the proper compound, with the desired physical attributes and a gradual transition from the surface layer to the core, calls for accurate temperature control, uniform heating, and correct introduction, distribution and maintenance of the oxidizing medium. The formation of the higher oxide hematite must be guarded against, as this forms a soft film lacking adherence and presenting an unsightly reddish color. Since oxygen

combines with the iron during the process, there is a slight growth, which must be allowed for in machining.

The Granosol coating consists of an iron phosphate with a high percentage of manganese phosphate. It is softer than grey iron and is sufficiently porous to absorb an appreciable amount of oil. The material is a dielectric and has anti-welding properties, which together with its oil-absorbing properties makes it an excellent scuff preventative. The coating is produced by immersing the part in an aqueous solution of phosphoric acid saturated with iron and manganese phosphates, at a temperature of 210 deg. Fahr. The surface of the iron is attacked by the acid, iron phosphate being formed, hydrogen freed, and manganese phosphate deposited. After the coating has assumed a depth of approximately 0.00025 in. the action slows down to a very low rate. The etching action of the acid ordinarily would reduce the dimensions of the part, but since the phosphoric acid already is saturated with iron phosphate, the coating does not dissolve, but remains integral with the piece treated. There is a very slight volume increase due to the process, not exceeding 0.00015 in.

Altinizing consists in the electro-deposition of tin on the ring surfaces. Before the plating process is started the surfaces must be cleaned chemically and then acid-etched, to ensure adhesion and prevent blistering of the coating. The plating ordinarily is effected in a bath of sodium-stannate solution, but it can be accomplished also in an acid bath of a tin salt.

The Feritex coating is produced by immersing the cleaned rings in a bath of sodium hydroxide, sulfur and water, which removes certain constituents of the cast iron and produces a slightly porous surface covered with a very thin film of iron sulfide.

Another process produces a coating of zinc and iron phosphates in a bath containing phosphoric acid and zinc phosphate. An activator is always used, and a very fine-grained, soft and porous coating is produced, which is known commercially as Bonderite D. After coating, the rings are dipped in an emulsion of soluble oil and water holding Acheson colloidal graphite in suspension.

The chemical coatings, such as iron-manganese and zinc-iron phosphates, are softer than the raw iron, which also makes possible a quick initial seating. However, while the coating as a whole is soft, the individual crystals are harder than the iron, so if they are scuffed off they aid in lapping in the parts.

## New Sales Program

A new sales program for their fan belt line is announced by the L. H. Gilmer Company, Philadelphia. A feature of the re-organized plan is the handling of their fan belt business through jobbing channels direct instead of through Johns-Manville Sales Corp., as has been done for the last few years. A simplified price schedule that embraces 98 per cent of total belt sales and a plan for quicker stock turn-over are said to be other features in the new program.



### PRECISION BUILT!

Why Must All Cole-Hersee Products Meet The Highest Test of Precision Accuracy?

**1940 HARNESSES FOR SEALED BEAM HEADLAMPS.**



Ford, Chevrolet, Plymouth, Dodge, Desoto, Chrysler, Buick, Pontiac.

**REPLACEMENT HEADLAMP HARNESSES**

Ford	years	Chevrolet	years
	1928-29		1929-30
	1928-29		1931-4
	1932		1935-6
	1933-34		1937
	1935-36		1938
	1939		1939

**PLYMOUTH**



1933 1934 1935-36 1937-38 1939

*because*

... Cole-Hersee Products are used by leading car manufacturers as original equipment which means that the engineering CALIBRE, the PERFORMANCE qualities must come up to the highest specifications and degree of efficiency.

**HYDRAULIC STOP LIGHT SWITCHES**

For All Cars to 1940




**SEND FOR CATALOG or any other information to Dept. A-5**

**COLE-HERSEE COMPANY**  
 54 Old Colony Avenue Boston, Mass.  
 Rep.—Eastern, Canada-Ontario-Quebec-Maritimes.  
 S. F. BACHER & CO., 310 Spadina Ave., Toronto, Ont.





# "YOU ARE GOING TO LOSE MONEY Unless --"

**W**HAT impression does your shop make when a car owner comes in for service or repairs?

If your equipment is old, battered-looking or incomplete, you may never get him in again. He'll turn to a shop that looks and acts alive, efficient, modern.

If you happen to be a car dealer, you'll be even worse off. Let a customer start going elsewhere for service, and you're likely to lose not only his accessory and repair business—but his *next new car purchase*, as well.

Don't let this happen to you. Modernize now. Make *your* shop the best equipped in town. Get them coming to you.

## Take This Quick Way to BIGGER PROFITS!

Look over your present equipment. List the new equipment you need to put your shop in first class shape.

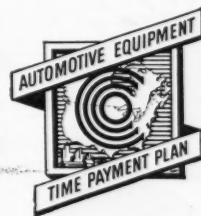
Then call in your jobber and get the total cost, and the A E P terms.

A E P is the official time payment plan of the equipment industry, backed by 97 of the outstanding manufacturers

and offered by more than 1400 jobbers, through Commercial Credit.

\* \* \*

If your jobber isn't at present using A E P for financing, mail us the coupon below and we'll send complete information at once to him and to you.



## COMMERCIAL CREDIT COMPANY

INSURANCE  
INCLUDED

### Commercial Bankers

#### WHAT NEW EQUIPMENT WOULD BRING YOU THE BIGGEST RETURNS?

**MAIL  
THE  
COUPON  
NOW!**

Let us tell you how to get it through AEP—small initial outlay—monthly liquidation—ample time—low cost—fully insured—one contract.

**COMMERCIAL CREDIT COMPANY, Baltimore, Md.**

Send me full details. What local jobbers offer A E P terms?

Name \_\_\_\_\_

Address, City & State \_\_\_\_\_

My Jobber is \_\_\_\_\_

## Legally Speaking

(Continued from page 59)

operate to release them from their liability. And if the repairman suspects there may be a trick in the proposed release transaction, he'll do well to ask his attorney about it *before* he signs it.

### Copyrighted Advertising

**T**HAT a repairman may come to legal and financial grief by publishing as his own advertising material that has been copyrighted by someone else was shown in a recent Federal court decision in Pennsylvania.

There a retailer borrowed from a merchant in another town matrices of advertisements which the other merchant had secured from an advertising service. The retailer then published under his own name several advertisements made from these matrices. Because these advertisements were copyrighted by the advertising service, the retailer was sued for his unauthorized use of the copyrighted material. The use of the advertisements, it appeared, was limited to merchants who subscribed to the service of the advertising concern.

The retailer said that he used the matrices without knowledge of the

copyright and called attention to the exceedingly small print with which notice of the copyright was given.

"The print is very small, it is true," said the court, "but really large enough to have put upon inquiry any careful person who obtained the matrices under the circumstances under which they came into his possession. But admitting lack of intention to infringe the copyright on his part, that does not release him from liability."

The advertising company could not prove any specific damage from the unauthorized use of their material. In view of this the court said:

"The court is therefore confined to the statutory allowance and will award the advertising company the minimum statutory amount of \$250 for each of the five infringements shown, making a total of \$1250, with a further allowance of \$150 as a reasonable counsel fee, and will also enjoin the defendant retailer from further infringement and order him to deliver up all matrices for making copies of any of the advertising material included in the company's service."

### Safe Appliances

**T**HAT an employer is obligated to furnish his employees with safe equipment for their work, was re-

cently pointed out by a Federal Court.

"An employer owes the duty of using reasonable care to furnish his employees with reasonably safe appliances with which to work," said the court.

If an employee is injured because of unsafe equipment furnished by his employer for the work, the employer is legally and financially liable for the injuries. The employer has no responsibility, however, where the injuries result from the employee's lack of skill and not from unsafe equipment.

### Does Contract Protect?

**W**HERE a repairman relies on the protection of a contract for service, equipment or other things vital to his business, he had better make sure that the contract really protects. A Texas court recently pointed out that a contract which specifies no definite time for its continuance may be ended virtually overnight. The case before the court concerned a contract for the lease of certain equipment.

"The contract shows to be a rental contract of personal property for hire and for no definite period of time," said the court. "It was, therefore, terminable at the option of either party to the contract. As a general

# The dollars will bloom



Hang up your Grey-Rock sign. Get the big profits that are sprouting all around Grey-Rock dealers. This can be your hang-up month, for brake business is flowering under Grey-Rock's greatest year of consumer advertising. The 50,000,000 audience of SATEVEPOST, COLLIER'S, LIFE, and TIME knows that your Grey-Rock sign means the finest brake linings and servicing methods. Go Grey-Rock—watch your new business sprout around your door.

# Grey-Rock



proposition a contract, indefinite as to the time of its performance, may be terminated by either party by giving notice of an intention to do so."

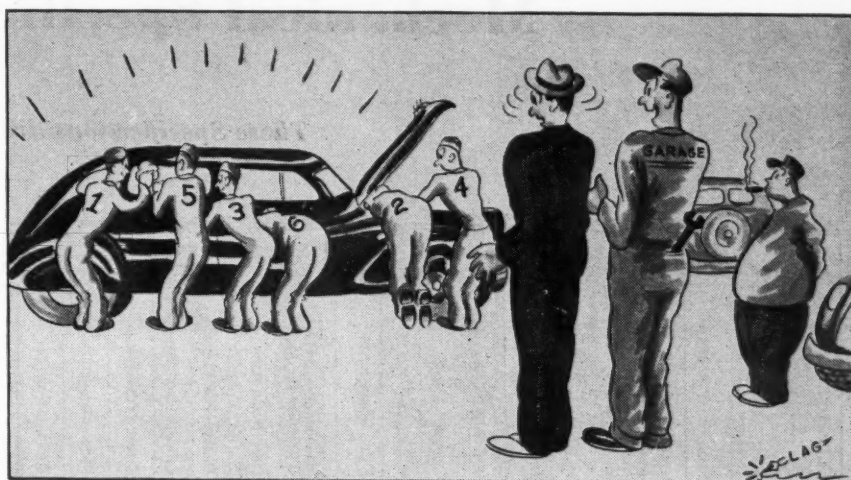
So, unless a repairman is willing to risk being suddenly "shut off" from the benefits of a contract, he should see to it that the contract itself specifies the period of time for which it is to be in effect.

### Dangerous Objects

A REPAIRMAN who has a dangerous machine or other object on his business premises is legally responsible for protecting other people from the danger. The Supreme Court of Oklahoma put it this way:

"If the premises are inherently dangerous, or if there is a dangerous instrumentality thereon such as a highly dangerous explosive, exposed electric wires and the like, it is usually willful or wanton negligence not to exercise ordinary care to prevent injury to a person who is actually known to be or reasonably is expected to be within the range of such danger."

Where the business premises or the dangerous object is such as to be naturally attractive to children, the repairman must see to it that children do not have access to the danger. If children do get access to the dangerous object which attracts them and



"The boss says—in case business goes down, that's their firing order!"

are hurt, the repairman will be legally and financially responsible for their injury, even though the children be trespassers on the place.

### Trade Customs

SOMETIMES, where there is a dispute about the meaning of certain terms in a contract, the courts look to the customs and usages in the trade or industry in which the contract is operative. Often the meaning of a contract can be clarified by reference to such trade customs.

But that's only where there's doubt about the meaning of certain terms in the contract. Where the terms and meaning of the contract are clear, a repairman who is a party to the contract cannot hope for a more favorable interpretation through the help of trade customs.

"The allegations with reference to custom in the trade are immaterial," said a Federal court in a recent case, "as the agreement here in question is clear upon its face and cannot be varied by proof of such allegations."

# n this month, tra, la! 🎵

**Give your car an even brake with Grey-Rock BALANCED BRAKE LININGS**

THIS IS THE SIGN OF A FIRST-CLASS SERVICE STATION

U. S. Asbestos Division of Raybestos-Manhattan, Inc., Manheim, Pa.

**HEAR MICE!**

**GREEN-AMBER-RED**

**Power**

forget that a "reserve power" ... ring your power so many "reserve-iray-Rock"

ick amber ts. Just as is calls for od brakes oss traffic ield. Stop smoothly, ted Brake

**even brake**

**BRAKES BALANCED**

THIS IS THE SIGN OF A FIRST-CLASS SERVICE STATION

**brake**

THIS IS THE SIGN OF A FIRST-CLASS SERVICE STATION

THESE ARE YOUR MAY ADS, CONTINUING GREY-ROCK'S SEASON-LONG CONSUMER CAMPAIGN IN THE 4 GREATEST WEEKLY MAGAZINES.



Use Balanced Braksets, world's finest replacements—and Kam-way the only shoe re-arc method—supported by regular ads to a 50,000,000 audience.

# BALANCED BRAKSETS

UNITED STATES ASBESTOS DIVISION of Raybestos-Manhattan, Inc., MANHEIM, PA. BRAKE LININGS • CLUTCH FACINGS • FAN BELTS HOSE • PACKINGS • RELINING EQUIPMENT

# Mechanical Specifications

These Specifications Are Brought Up-to-Date Each Month by the

Line Number	MAKE AND MODEL	Lowest Priced 4-D. Sed. (Divd.)	Wheelbase (In.)	Tire Size (In.)	ENGINE																	CHASSIS						
					No. of Cylinders, Bore and Stroke	Taxable Hp.	Piston Displacement (Cu. In.)	Maximum Brake HP. at Specified R.P.M.	Compression Ratio (to 1.)	Displacement Factor	Cylinder Head Material	Camshaft Drive Make	Piston Material	Oil Cleaner Make	Air Cleaner Make	Carburetor Make	Muffler Make	Electrical System Make	Battery Make	Clutch	Type and Make	Gearset Make	Universal Type and Make	Rear Axle Type and Make	Rear Axle Ratio	Front Spring Suspension		
1	Bantam.....65		75	4.00/15	4-2.26x3.12	8.17	50.1	22-3800	7.40	CI	Own	Als	No	AC	Zen	McK	AL	AL	P.Ro	WG	m-UP	1/2 Spi	5.25 Tr					
2	Buick.....40-40	996	121	6.50/16	8-3 1/8 x 4 1/8	30.6	248.0	107-3400	6.10	37.0	CI	LB	Ala	AC	AC	S-C	Hay	DR	Del	P.O.L	Own	Mp-G-S	1/2 Own	4.40 IC				
3	Buick.....40-50	1109	121	6.50/16	8-3 1/8 x 4 1/8	30.6	248.0	107-3400	6.10	35.8	CI	LB	Ala	AC	AC	S-C	Hay	DR	Del	P.O.L	Own	Mp-G-S	1/2 Own	4.40 IC				
4	Buick.....40-60	1211	126	7.00/15	8-3 1/8 x 4 1/8	37.8	320.2	141-3600	6.25	39.8	CI	LB	Ala	AC	AC	S-C	Hay	DR	Del	P.O.B	Own	Mp-G-S	1/2 Own	3.90 IC				
5	Buick.....40-70	1359	126	7.00/15	8-3 1/8 x 4 1/8	37.8	320.2	141-3600	6.25	38.8	CI	LB	Ala	AC	AC	S-C	Hay	DR	Del	P.O.B	Own	Mp-G-S	1/2 Own	3.90 IC				
6	Buick.....40-80	1553	133	7.50/16	8-3 1/8 x 4 1/8	37.8	320.2	141-3600	6.25	36.3	CI	LB	Ala	AC	AC	S-C	Hay	DR	Del	P.O.B	Own	Mp-G-S	1/2 Own	4.18 IC				
7	Buick.....40-90	1942	140	7.50/16	8-3 1/8 x 4 1/8	37.8	320.2	141-3600	6.25	37.6	CI	LB	Ala	AC	AC	S-C	Hay	DR	Del	P.O.B	Own	Mp-G-S	1/2 Own	4.55 IC				
8	Cadillac-V8.....40-60S	2090	127	7.00/16	8-3 1/2 x 4 1/2	39.2	346.0	135-3400	6.25	40.1	CI	Mor	Ala	No	AC	Str	Wal	DR	Del	P.Long	Own	Nb-Mec	1/2 Own	3.92 IC				
9	Cadillac-V8.....40-62	1745	129	7.00/16	8-3 1/2 x 4 1/2	39.2	346.0	135-3400	6.25	40.5	CI	Mor	Ala	No	AC	Str	Wal	DR	Del	P.Long	Own	Nb-Mec	1/2 Own	3.92 IC				
10	Cadillac-V8.....40-72	2670	139	7.50/16	8-3 1/2 x 4 1/2	39.2	346.0	140-3400	6.70	38.0	CI	Mor	Ala	No	AC	Str	Wal	DR	Del	P.Long	Own	Nb-Mec	1/2 Own	4.31 IC				
11	Cadillac-V8.....40-75	2995	141	7.50/16	8-3 1/2 x 4 1/2	39.2	346.0	140-3400	6.70	38.6	CI	Mor	Ala	No	AC	Str	Wal	DR	Del	P.Long	Own	Nb-Mec	1/2 Own	4.58 IC				
12	Cadillac-16.....40-90	5140	141	7.50/16	16-3 1/4 x 4 1/4	67.6	431.0	185-3600	6.75	43.1	CI	Mor	Ala	AC	AC	Car	Wal	DR	Del	P.Long	Own	Nb-Mec	1/2 Own	4.31 IC				
13	Chevrolet, Master 85	740	113	6.00/16	6-3 1/2 x 3 3/4	29.4	216.5	85-3400	6.25	34.0	CI	Var	CI	No	AC	Car	Var	DR	Del	P.Own	Own	Nb-Own	1/2 Own	3.73 C				
14	Chevrolet DL & MDL	766	113	6.00/16	6-3 1/2 x 3 3/4	29.4	216.5	85-3400	6.25	36.7	CI	Var	CI	No	AC	Car	Var	DR	Del	P.Own	Own	Nb-Own	1/2 Own	4.11 IC				
15	Chrysler.....C-25	995	122 1/2	6.25/16	6-3 3/8 x 4 1/2	27.3	241.5	108-3600	6.50	36.6	CI*	Mor	Al	Pur	AC	Str	NS	AL	Wil	P.B&B	Own	Cb-UP	1/2 Own	3.90 IC				
16	Chrysler.....C-26	1180	128 1/2	7.00/15	8-3 1/4 x 4 1/2	33.8	323.5	135-3400	6.80	43.7	CI*	M-W	Al	Pur	AC	Str	NS	AL	Wil	P.B&B	Own	Cb-UP	1/2 Own	3.91 IC				
17	Chrysler.....C-27		146 1/2	7.50/15	8-3 1/4 x 4 1/2	33.8	323.5	137-3400	6.80	39.9	Al	M-W	Al	Pur	AC	Str	NS	AL	Wil	P.B&B	Own	Cb-UP	1/2 Own	4.55 IC				
18	Crosley.....A	1362	80	4.25/12	2-3x2 3/4	7.2	38.9	15-4200	5.50	CI	For	CI	Pur	AC	Til	Rex	AL	AL	P.Ro	WG	St	1/2 Spi	5.14 C					
19	De Soto.....S-7	945	122 1/2	6.00/16	6-3 3/8 x 4 1/4	27.3	228.1	100-3600	6.50	37.6	CI*	Mor	Al	Pur	AC	Car	NS	AL	Wil	P.B&B	Own	Cb-UP	1/2 Own	4.10 IC				
20	Dodge.....D-14-17	855	119 1/2	6.00/16	6-3 1/4 x 4 3/8	25.3	217.8	87-3600	6.50	36.8	CI	Mor	Als	Pur	AC	Str	NS	AL	AL	P.B&B	Own	Nb-UP	1/2 Own	4.10 IC				
21	Ford V8-60.....1940	1685	112	5.50/16	8-2.6x3.2	21.6	136.0	60-3500	6.60	28.1	Al	Dia	CS	No	Yes	Own	Own	O	Own	P.Os	Own	m-Spi	3/4 Own	4.44 Tr				
22	Ford V8-85.....1940	1725	112	6.00/16	8-3 1/8 x 3 3/4	30.0	221.0	65-3800	6.15	36.2	CI	Dia	CS	No	Yes	Own	Own	O	Own	P.Os	Own	m-Spi	3/4 Own	3.78 Tr				
23	Graham, DeL. & Cus.	995	120	6.00/16	6-3 1/4 x 4 3/8	25.3	217.8	92-3800	6.65	CI	LB	Als	No	AC	Car	Old	DR	Wil	P.Long	WG	Nb-UP	1/2 Spi	4.27 C					
24	Graham, Sc & Cus. Sc	1130	120	6.25/16	6-3 1/4 x 4 3/8	25.3	217.8	120-4000	6.65	CI	LB	Als	No	AC	Car	Old	DR	Wil	P.Long	WG	Nb-UP	1/2 Spi	4.27 C					
25	Hudson Six & DeL. 6	763	113	(h)	6-3x4 1/2	21.6	175.0	92-4000	7.00	33.5	CI	Ge	Als	No	AC	Car	Old	AL	Nat	Pw.Own	Own	Nb-Spi	1/2 Own	4.55 IC				
26	Hudson Sup. & CC. 6	870	118-125	(i)	6-3x5	21.6	212.0	102-4000	6.50	35.4	CI	Ge	Als	No	AC	Car	Old	AL	Nat	Pw.Own	Own	Nb-Spi	1/2 Own	4.11 IC				
27	Hudson.....8 & CC. 8	952	118-125	(k)	8-3x4 1/2	28.8	254.0	128-4200	6.50	40.9	CI	Ge	Als	No	AC	Car	Old	AL	Nat	Pw.Own	Own	Nb-Spi	1/2 Own	4.11 IC				
28	La Salle.....40-50, 52	1320	123	7.00/16	8-3 3/8 x 4 1/2	36.4	322.0	130-3400	6.25	40.3	CI	Mor	Ala	No	AC	Car	Wal	DR	Del	P.Long	Own	Nb-Mec	1/2 Own	3.92 IC				
29	Lincoln-V12.....	136-145	125	7.50/17	12-3 1/2 x 4 1/2	46.8	414.0	150-3400	6.38	38.5	Al	Mor	Al	Pur	AC	Str	Old	AL	Exi	P.Long	Own	m-Spi	FF Tim	4.58 C				
30	Lincoln-Zephyr.....1940	1400	125	7.00/16	12-2 1/2 x 3 3/4	39.6	292.0	120-3500	7.20	43.0	Al	Mor	Dia	CS	Own	Own	O	Own	P.Os	Own	m-Spi	3/4 Own	4.44 Tr					
31	Mercury.....1940	1960	116	6.00/16	8-3.187x3 1/2	32.5	239.0	95-3600	6.15	33.8	CI	Dia	CS	AC	Own	Own	O	Own	P.Os	Own	m-Spi	3/4 Own	3.54 Tr					
32	Nash-Lafay.....4010	875	117	6.00/16	6-3 3/8 x 4 3/8	27.3	234.8	99-3400	6.30	36.8	CI	Whit	Als	No	AC	Car	Wal	AL	USL	P.B&B	Own	Nb-Mec	1/2 Own	4.10 IC				
33	Nash.....Amb. 6, 4020	985	121	6.25/16	6-3 3/8 x 4 3/8	27.3	234.8	105-3400	6.00	35.4	CI	Whit	Als	BS	AC	Car	Wal	AL	USL	P.B&B	Own	Nb-Mec	1/2 Own	4.10 IC				
34	Nash.....Amb. 8, 4080	1195	125	7.00/15	8-3 1/8 x 4 1/4	31.2	260.8	115-3400	6.00	35.2	CI	Dia	Als	BS	AC	Car	Wal	AL	USL	P.B&B	Own	Nb-Mec	1/2 Own	4.10 C				
35	Oldsmobile.....60	899	116	6.00/16	6-3 1/8 x 4 1/2	28.4	229.7	95-3400	6.10	37.8	CI	Whit	Ala	No	AC	Car	Var	DR	Del	P.B&B	Own	Rb-Mec	1/2 Own	4.11 IC				
36	Oldsmobile.....70	963	120	6.50/16	6-3 1/8 x 4 1/2	28.4	229.7	95-3400	6.10	37.8	CI	Whit	Ala	No	AC	Car	Var	DR	Del	P.B&B	Own	Rb-Mec	1/2 Own	4.30 IC				
37	Oldsmobile.....90	1131	124	7.00/15	8-3 1/4 x 3 3/4	33.8	257.1	110-3600	6.20	37.2	CI	LB	Ala	No	AC	Car	Var	DR	Del	P.B&B	Own	Rb-Mec	1/2 Own	4.30 IC				
38	Packard.....110	975	122	6.25/16	6-3 1/8 x 4 1/2	29.4	245.0	100-3200	6.39	40.5	CI	Mor	Als	No	AC	Str	Wal	AL	PO	Ps.Long	Own	Rb-Mec	1/2 Own	4.11 IC				
39	Packard.....120	1146	127	6.50/16	8-3 1/4 x 4 1/2	33.8	262.0	120-3600	6.41	40.3	CI	Mor	Als	No	AC	Str	Wal	AL	Wil	Ps.Long	Own	Rb-Mec	1/2 Own	4.09 IC				
40	Packard.....160-80	1632	127-38-48	7.00/16	8-3 1/4 x 4 1/2	39.2	356.0	160-3500	6.45	43.8	CI	Mor	Als	AC	AC	Str	Wal	AL	Wil	Ps.Long	Own	Rb-Mec	1/2 Own	(b) IC				
41	Plymouth.....P9	740	117 1/2	5.50/16	6-3 1/8 x 4 3/8	23.4	201.3	84-3600	6.70	34.6	CI*	Mor	Al	Pur	Al	Car	NS	AL	AL	P.B&B	Own	Nb-UP	1/2 Own	3.90 IC				
42	Plymouth.....P10	805	117 1/2	6.00/16	6-3 1/8 x 4 3/8	23.4	201.3	84-3600	6.70	34.8	CI*	Mor	Al	Pur	Al	Car	NS	AL	AL	P.B&B	Own	Nb-UP	1/2 Own	4.10 IC				
43	Pontiac 6.....40-25	876	117	6.00/16	6-3 1/8 x 4	28.3	222.7	87-3520	6.50	38.2	CI	Mor	CNI	No	AC	Car	Var	DR	Del	P.In	Own	Rb-Mec	1/2 Own	4.30 IC				
44	Pontiac 6.....40-26	932	120	6.00/16	6-3 1/8 x 4	28.3	222.7	87-3520	6.50	37.4	CI	Mor	CNI	No	AC	Car	Var	DR	Del	P.In	Own	Rb-Mec	1/2 Own	4.30 IC				
45	Pontiac 8.....40-28	970	120	6.50/16	8-3 1/4 x 3 3/4	33.8	248.9	100-3700	6.50	39.8	CI	Mor	CNI	No	AC	Car	Var	DR	Del	P.In	Own	Rb-Mec	1/2 Own	4.30 IC				
46	Pontiac 8.....40-29	1072	122	6.50/16	8-3 1/4 x 3 3/4	33.8	248.9	103-3700	6.50	38.0	CI	Mor	CNI	No	AC	Car	Var	DR	Del	P.In	Own	Rb-Mec	1/2 Own	4.30 IC				
47	Studebaker, Champ.	740		5.50/16	6-3x3 3/4	21.6	164.3	78-4000	6.50	38.7	CI	Dia	Ly	No	AC	Car	Wal	AL	Wil	P.B&B	WG	Nb-Spi	1/2 Spi	4.56 IT				
48	Studebaker, Com.10A	965		6.25/16	6-3 1/8 x 4 3/8	26.3	226.0	90-3400	6.00	39.9	CI	Dia	Ly	Fram	AC	Str	Old	DR	Wil	P.B&B	WG	Nb-Spi	1/2 Spi	4.55 IT				
49	Studebaker, Pres.6C	1095		6.50/16	8-3 1/8 x 4 1/2	30.0	250.4	110-3600	6.00	40.9	CI	Dia	Ly	Fram	AC	Str	Old	DR	Wil	P.In	WG	Nb-Spi	1/2 Spi	4.55 IT				
50	Willys.....440	1545	102	5.50/16	4-3 1/8 x 4 3/8	15.6	134.2	61-3600	6.48	33.2	CI*	LB	Al	No	AC	Car	McK	AL	AL*	P.R-B	WG	m-UP	1/2 Own	4.55 C				

## ABBREVIATIONS-General

o-Others also  
 \*Measured on rim of Flywheel  
 (1)-22 on Ford V8, 21 on Del. Ford V8.  
 1/2-Semi-floating  
 3/4-Three-quarter floating  
 †-With clearance of .015 the valve is .004 off its seat.  
 ‡-Does not include Federal Taxes  
 §-Computed on basis of displacement, gear ratio, effective tire diameter, and weight with normal load.

## A-Above (rods removed from)

A-After top center  
 AA-Automatic adjuster  
 Ad-Advanced Al-Aluminum  
 Ala-Aluminum, Anode processed  
 Als-Aluminum with struts  
 Au-Automatic  
 (a)-3.92-1803-6; 4.09-1804-7; 4.36-1805-8  
 B-Below (rods removed from)  
 B-Before top center  
 (c)-1-1/2, 1-3/4 C-Conventional  
 C-Cold (tappet clearance)

## Cb-Cross type with roller bearings

Ch-Chain  
 CNI-Chrome Nickel Iron  
 CI-Cast Iron  
 CS-Cast Steel  
 (d)-1-1/2, 1-3/4  
 (e)-0+1/4-0  
 (f)-1/2-0  
 F-Floating (piston pin)  
 (g)-1-3/4, 1-3/8  
 H-Hot (tappet clearance)  
 (h)-Six-5.50/16, Del. 6-6.00/16  
 (i)-Super. 6.00/16, C.C. 6.25/16

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# Tune-Up Specifications

Car Manufacturers and Supersede All Others Previously Published

				RINGS				VALVES										IGNITION										FRONT AXLE									
Service Brake Make and Type	Steering Gear Make and Type	Compression Pressure at Cranking Speed (Lbs.)	Spark Plug Make and Type	No. and Width Comp.	No. and Width Oil	Piston Pin Diameter	Piston Pin Locked In	Head Diameter and Seat Angle				Operating Tappet Clearance	Intake Valve Opens Before or After T. C.		Timing				Rods Removed From	Crankpin Diameter (Ins.)	Crankpin Length (Ins.)	Capacity Crankcase (Qts.) Dry	Capacity Cooling System (Qts.)	Caster (Degrees)	Camber (Degrees)	Toe-in (Inches)	King Pin Inclination (Degrees)	Line Number									
								Inlet (Ins.)	Inlet Seat Angle (Degrees)	Exhaust (Ins.)	Exhaust Seat Angle (Degrees)		Stem Diameter (Ins.)	Inlet	Exhaust	Inlet Tappet Clearance for Valve Timing	No. of Degrees	No. of Flywheel Teeth											Breaker Points Gap (Ins.)	Spark Plug Gap (Ins.)	Spark Occurs °TC	No. of Flyw. Teeth Spark Occurs TC	Breaker Housing				
OM R	135 Ch-H-10	2-3/4	1-7/8	2-3/4	1-7/8	3/8	R	1 1/8	45	1 1/8	45	.279	.011H	.012H	.011	19B	.....	.022	.025	4BT	.....	Au	A	1 1/4	1	3	5 1/2	15	1 1/4	1 1/8	1 1/2	1					
BH S	112 AC-46	2-3/4	2-3/4	2-3/4	2-3/4	3/8	R	1 1/8	45	1 1/8	45	.372	.015H	.015H	++	13B	5 1/2 B	.015	.025	4B	1 1/2 B	Au	A	2	1 1/2	8	12 1/2	3 1/2	1 1/4	1 1/8	3 1/4	2					
BH S	112 AC-46	2-3/4	2-3/4	2-3/4	2-3/4	3/8	R	1 1/8	45	1 1/8	45	.372	.015H	.015H	++	13B	5 1/2 B	.015	.025	4B	1 1/2 B	Au	A	2	1 1/2	8	12 1/2	3 1/2	1 1/4	1 1/8	3 1/4	3					
BH S	114 AC-46	2-3/4	2-3/4	2-3/4	2-3/4	3/8	R	1 1/8	45	1 1/8	45	.372	.015H	.015H	++	14B	6B	.015	.025	6B	1 3/4 B	Au	A	2 1/4	1 1/2	10	16	3 1/2	1 1/4	1 1/8	3 1/4	4					
BH S	114 AC-46	2-3/4	2-3/4	2-3/4	2-3/4	3/8	R	1 1/8	45	1 1/8	45	.372	.015H	.015H	++	14B	6B	.015	.025	6B	1 3/4 B	Au	A	2 1/4	1 1/2	10	16	3 1/2	1 1/4	1 1/8	3 1/4	5					
BH S	114 AC-46	2-3/4	2-3/4	2-3/4	2-3/4	3/8	R	1 1/8	45	1 1/8	45	.372	.015H	.015H	++	14B	6B	.015	.025	6B	1 3/4 B	Au	A	2 1/4	1 1/2	10	16	3 1/2	1 1/4	1 1/8	3 1/4	6					
BH S	114 AC-46	2-3/4	2-3/4	2-3/4	2-3/4	3/8	R	1 1/8	45	1 1/8	45	.372	.015H	.015H	++	14B	6B	.015	.025	6B	1 3/4 B	Au	A	2 1/4	1 1/2	10	16	3 1/2	1 1/4	1 1/8	3 1/4	7					
BH S	114 AC-46	2-3/4	2-3/4	2-3/4	2-3/4	3/8	R	1 1/8	45	1 1/8	45	.372	.015H	.015H	++	14B	6B	.015	.025	6B	1 3/4 B	Au	A	2 1/4	1 1/2	10	16	3 1/2	1 1/4	1 1/8	3 1/4	8					
BH S	155x AC-104	2(c)	2-3/4	2-3/4	2-3/4	3/8	F	1.88	45	1.63	45	.341	AA	AA	AA	TC	.....	.015	.027	5B	.....	Au	A	2.46	2 1/2	7	24 1/2	(nn)	0 to +1	0-1/8	5° 6'	9					
BH S	155x AC-104	2(c)	2-3/4	2-3/4	2-3/4	3/8	F	1.88	45	1.63	45	.341	AA	AA	AA	TC	.....	.015	.027	5B	.....	Au	A	2.46	2 1/2	7	24 1/2	(nn)	0 to +1	0-1/8	5° 6'	10					
BH S	170x AC-104	2(c)	2-3/4	2-3/4	2-3/4	3/8	F	1.88	45	1.63	45	.341	AA	AA	AA	TC	.....	.015	.027	5B	.....	Au	A	2.46	2 1/2	7	24 1/2	(nn)	0 to +1	0-1/8	5° 6'	11					
BH S	170x AC-104	2(c)	2-3/4	2-3/4	2-3/4	3/8	F	1.88	45	1.63	45	.341	AA	AA	AA	TC	.....	.015	.027	5B	.....	Au	A	2.46	2 1/2	7	24 1/2	N 1/2- N1	0 to +1	0-1/8	5° 6'	12					
BH S	180x AC-104	2(c)	2-3/4	2-3/4	2-3/4	3/8	F	1.50	45	1.37	45	.341	AA	AA	AA	6B	.....	.015	.032	6B	.....	Au	A	2.00	1 1/2	11	30	N 1/2- N1	0 to +1	0-1/8	5° 1'	13					
OH O	AC-44	2-1/8	1-1/8	2-1/8	1-1/8	3/8	R	1 1/4	30	1 1/4	30	.340	.006H	.013H	.006	3B	.....	.021	.040	5B	.....	Au	A	2 1/8	1 1/2	5	14	2 1/4-3/2	1 1/4-1/2	0 1/8-1/8	7° 10'	14					
OH O	AC-44	2-1/8	1-1/8	2-1/8	1-1/8	3/8	R	1 1/4	30	1 1/4	30	.340	.006H	.013H	.006	3B	.....	.021	.040	5B	.....	Au	A	2 1/8	1 1/2	5	14	2 1/4-3/2	1 1/4-1/2	0 1/8-1/8	4° 45'	15					
LH G	145x AL-A7B	2-1/8	2-3/4	2-3/4	2-3/4	3/8	F	1 1/8	45	1 1/8	45	.340	.008H	.010H	.014	12B	.....	.020	.025	TC	TC	Au	A	2 1/8	1 1/2	5	18	N1 to +1	0 to +1	0-1/8	4 1/2-6	16					
LH G	155x AL-A7B	2-1/8	2-3/4	2-3/4	2-3/4	3/8	F	1 1/8	45	1 1/8	45	.340	.008H	.010H	.011	6B	.....	.018	.025	TC	TC	Au	A	2 1/8	1 1/2	6	24	N1 to +1	0 to +1	0-1/8	4 1/2-6	17					
LH G	155x AL-A7B	2-1/8	2-3/4	2-3/4	2-3/4	3/8	F	1 1/8	45	1 1/8	45	.340	.008H	.010H	.011	6B	.....	.018	.025	3B	.....	Au	A	2 1/8	1 1/2	6	24	N1 to +1	0 to +1	0-1/8	4 1/2-6	18					
HM R	90 AL-A5	2-1/8	1-3/8	2-1/8	1-3/8	3/8	P	1 1/8	45	1 1/8	45	.312	.006C	.007C	.006	20B	5 1/2 B	.020	.025	3B	1B	A	1 1/2	3 1/2	2	.....	6-11	2	.....	6 1/2	19						
LH G	145x AL-A7B	2-1/8	2-3/4	2-3/4	2-3/4	3/8	F	1 1/8	45	1 1/8	45	.340	.008H	.010H	.014	12B	.....	.020	.025	2B	.....	Au	A	2 1/8	1 1/2	5	17	N1 to +1	0 to +1	0-1/8	4 1/2-6	20					
LH G	140x AL-A7B	2-1/8	2-3/4	2-3/4	2-3/4	3/8	F	1 1/8	45	1 1/8	45	.340	.008H	.008H	.011	6A	2 1/2 A	.020	.025	TC	TC	Au	A	2 1/8	1	5	15	N1 to +1	0 to +1	0-1/8	4 1/2-6	21					
LH G	105 Ch-H-10	2-3/4	1-3/8	2-3/4	1-3/8	3/8	F	1.28	45	1.28	45	.279	.011C	.011C	.013	9 1/2 B	3 1/2 B	.015	.025	4B	1 1/2 B	Au	A	1.70	1.41	4	13	4 1/2-9	1 1/4-1	1 1/8-1 1/2	8	22					
LH G	100 Ch-H-10	2-3/4	1-3/8	2-3/4	1-3/8	3/8	F	1.53	45	1.53	45	.310	.011C	.011C	.013	TC	TC	.015	.025	4B	1 1/2 B	Au	A	2	1.75	5	22	4 1/2-9	1 1/4-1	1 1/8-1 1/2	8	21					
OH R	120 Ch-H-10	2-3/4	2-3/4	2-3/4	2-3/4	3/8	R	1 1/8	45	1 1/8	45	.341	.010H	.010H	.012	8 1/2 B	.....	.018	.025	TC	TC	Au	A	2 1/8	1 1/2	5	14	3-4	1	1 1/8-1 1/2	7 1/2	23					
OH R	130 Ch-H-10	2-3/4	2-3/4	2-3/4	2-3/4	3/8	R	1 1/8	45	1 1/8	45	.341	.010H	.010H	.012	8 1/2 B	.....	.018	.025	4 1/2 A	.....	Au	A	2 1/8	1 1/2	5	15	3-4	1	1 1/8-1 1/2	7 1/2	24					
BH G	125 Ch-J-8-A	2-3/4	2(d)	2-3/4	2(d)	3/4	F	1 1/8	45	1 1/8	45	.341	.006H	.008H	.....	10 1/2 B	.....	.020	.032	TC	TC	Au	A	1 1/8	1 1/2	6	13	0-1/4	1 1/8-1/2	1 1/8-1/2	3° 36'	25					
BH G	120 Ch-J-8-A	2-3/4	2(d)	2-3/4	2(d)	3/4	F	1 1/8	45	1 1/8	45	.341	.006H	.008H	.....	10 1/2 B	.....	.020	.032	TC	TC	Au	A	1 1/8	1 1/2	6	13	0-1/4	1 1/8-1/2	1 1/8-1/2	3° 36'	26					
BH G	119 Ch-J-8-A	2-3/4	2(d)	2-3/4	2(d)	3/4	F	1 1/8	45	1 1/8	45	.343	.006H	.008H	.....	10 1/2 B	.....	.017	.032	TC	TC	Au	A	1 1/8	1 1/2	9	18	0-1/4	1 1/8-1/2	1 1/8-1/2	3° 36'	27					
BH S	155x AC-104	2(c)	2-3/4	2-3/4	2-3/4	3/8	F	1.88	45	1.63	45	.341	AA	AA	AA	TC	TC	.015	.027	5B	2 1/2 B	Au	A	2 1/8	2 1/2	7	25	(nn)	0-3/4	1 1/8-1/2	5° 6'	28					
OM O	105 Ch-7	2-1/8	2-3/4	2-3/4	2-3/4	3/8	F	1 1/8	45	1 1/8	45	.311	AA	AA	AA	21B	6 1/2 B	.020	.029	7B	2 1/2 B	Au	B	2 1/8	2	12	32	1 1/2	1	1 1/8-1/2	7 1/2	29					
BH G	110 Ch-H-10	2-3/4	1-3/8	2-3/4	1-3/8	3/8	F	1.53	45	1.53	45	.311	AA	AA	AA	10 1/2 B	.....	.015	.029	4B	1 1/2 B	Au	A	2 1/8	1.75	5	27	3-5	1 1/4-3/4	1 1/8-1/2	3 1/4-4 1/2	30					
BH G	100 Ch-H-10	2-3/4	1-3/8	2-3/4	1-3/8	3/8	F	1.53	45	1.53	45	.310	.011C	.011C	.013	TC	TC	.015	.025	4B	1 1/2 B	Au	A	2.14	1.75	5	22	4 1/2-9	1 1/4-1	1 1/8-1/2	8	31					
BH G	110 AL-B7-A	2-1/8	2-3/4	2-3/4	2-3/4	3/8	F	1 1/8	45	1 1/8	45	.340	.015	.015	.015	21 1/2 B	6B	.020	.025	TC	TC	Au	A	2	1.42	6	19	0-N 1/2	1 1/4-3/4	1 1/8-1/2	4 1/2	32					
BH G	125 AC-45	2-1/8	2-3/4	2-3/4	2-3/4	3/8	F	1 1/8	45	1 1/8	45	.372	.015	.015H	.015	24 1/2 B	7B	.020	.025	6B	1 1/2 B	Au	A	2	1.42	6	16	0-N 1/2	1 1/4-3/4	1 1/8-1/2	4 1/2	33					
BH G	110 AC-45	2-1/8	2-3/4	2-3/4	2-3/4	3/8	F	1 1/8	45	1 1/8	45	.372	.015H	.015H	.015	20B	6B	.020	.025	9B	3/4 B	Au	B	2	1.24	7	17	0-N 1/2	1 1/4-3/4	1 1/8-1/2	4 1/2	34					
BH S	146x AC-45	2-3/4	2-3/4	2-3/4	2-3/4	3/8	P	1 1/8	30	1 1/8	45	.340	.008H	.011H	.012	5B	2B	.020	.040	TC	TC	Au	A	2 1/8	1 1/2	5	17 1/2	0-N 3/4	N1 to +1	1 1/8-1/2	4° 51'	35					
BH S	146x AC-45	2-3/4	2-3/4	2-3/4	2-3/4	3/8	P	1 1/8	30	1 1/8	45	.340	.008H	.011H	.012	5B	2B	.020	.040	TC	TC	Au	A	2 1/8	1 1/2	5	17 1/2	0-N 3/4									

# Motor Car Price, Weight and Body Table

Following are delivered prices at factory for cars with standard equipment and include all federal taxes with exception of Crosley, Ford, Lincoln, Lincoln-Zephyr, Mercury and Willys. Optional equipment, state or local taxes, transportation charges and finance charges are extra.

BODY, MAKE AND MODEL	Delivered Price	Shipping Weight	BODY, MAKE AND MODEL	Delivered Price	Shipping Weight	BODY, MAKE AND MODEL	Delivered Price	Shipping Weight	BODY, MAKE AND MODEL	Delivered Price	Shipping Weight	BODY, MAKE AND MODEL	Delivered Price	Shipping Weight	BODY, MAKE AND MODEL	Delivered Price	Shipping Weight
<b>BANTAM</b>			<b>CHEVROLET</b>			<b>DODGE</b>			<b>HUDSON</b>			<b>NASH</b>			<b>PACKARD</b>		
65			Master 85			Special D17			(Continued)			(Continued)			(Continued)		
Std. Coupe, 2p.	399	1255	Bus. Coupe	659	2885	Coupe, 2p.	755	2867	Country Club			Sedan, trk., 4d.	985	3385	Model 1808	2669	4585
Master Cou., 2p.	449	1275	Twn.Sed., 2d., 5p.	699	2915	Sedan, 2d., 5p.	815	2942	6-43			A. P. Cabriolet	1085	3410	Tour. Limousine	2541	4510
Master Road., 2p.	449	1200	Sport Sed., 4d., 5p.	740	2930	Sedan, 4d., 5p.	855	2997	Sedan, 4d., 6p.	1018	3240	Ambassador 8			Tour. Sedan		
Pickup Truck	475	1280	Stat.Wag., 4d., 8p.	903	3105				Sedan, 4d., 8p.	1230		Bus. Coupe	1135	3555	Rollson A. W.		
Panel Truck	489	1350				De Luxe D14						Sedan, 2d.	1165	3620	Town Car	4575	4175
Conv. Coupe, 2p.	525	1275	Master			Coupe, 2p.	803	2905	Eight-44			A. P. Coupe	1170	3575	*F.O.B. New York City		
Conv. Sed., 4p., 2d.	549	1295	De Luxe			Coupe, 2-4p.	855	2973	Coupe, 3p.	860	3040	Sedan, 4d.	1195	3655			
Stat.Wag., 4p., 2d.	575	1400	Bus.Cou., 2d., 2p.	684	2920	Conv. Coupe, 5p.	1030	3190	Sedan, 2d., 6p.	918	3140	Sedan, trk., 4d.	1195	3660			
			Coupe, 2d., 4p.	715	2925	Sedan, 2d., 5p.	860	2990	Vict. Coupe, 5p.	942	3075	A. P. Cabriolet	1295	3640			
			Twn.Sed., 2d., 5p.	725	2965	Sedan, 4d., 7p.	905	3028	Conv. Coupe, 5p.	952	3185						
			Spt. Sed., 4d., 5p.	766	2990	Limousine, 7p.	1095	3460	Conv.Sed., 2d., 6p.	1087	3065						
							1170			1122	3130						
<b>BUICK</b>			<b>Special</b>			<b>FORD</b>			<b>Country Club</b>			<b>OLDSMOBILE</b>			<b>PLYMOUTH</b>		
Special 40-40			Bus.Cou., 2d., 2p.	720	2930	V8-60			8-47			Six-Series 60			Roadking		
Bus. Coupe	895	3505	Twn. Sed., 2d., 5p.	750	2945	Bus. Coupe	620		Sedan, 4d., 6p.	1118	3285	Bus. Coupe, 3p.	807	3030	Coupe	645	2769
Sport Coupe	950	3540	Cabriolet, 2d., 4p.	761	2980	Coupe	600	2519	Sedan, 4d., 8p.	1330		Club Coupe, 3-6p.	848	3015	Tour.S., 2d., 5p.	699	2834
Tour.Sed., 2d., 5p.	955	3605	Stat.Wag., 4d., 8p.	802	3010	Tudor Sedan	640	2669				Sedan, 2d., 6p.	853	3065	Tour.S., 4d., 5p.	740	2869
Tour.Sed., 4d., 5p.	996	3660		873	2995	Fordor Sedan	685	2696	<b>LA SALLE</b>			Conv. Cou., 3-6p.	899	3100	Util.Sed., 2d., 2p.	699	2769
Conv. C., 2d., 5p.	1077	3865		934	3160				40-50			Station Wagon	996	3110			
C. Phae., 4d., 5p.	1355	3755				V8-85			Coupe, 2p.	1240	3700	Six-Series 70			De Luxe		
			<b>CHRYSLER</b>			Bus. Coupe	660		Tour.Sed., 2d., 5p.	1280	3760	Bus. Coupe, 3p.	865	3100	Coupe	725	2804
Super 40-50			Royal Six			Coupe	640	2763	Tour. Sedan, 5p.	1320	3790	Club Cou., 3-6p.	901	3105	Coupe, 4p.	770	2749
Sport Coupe	1058	3735	Coupe, 5p.	895	3075	Tudor Sedan	680	2909	Conv. Coupe, 2p.	1395	3805	Tour.Sed., 2d., 6p.	912	3170	Conv.Cou., 2-4p.	950	3049
Tou.Sed., 4d., 6p.	1109	3790	Vict. Sedan, 6p.	960	3110	Fordor Sedan	725	2936	Conv. Sed., 5p.	1800	4000	Tour.Sed., 4d., 6p.	963	3220	Tour.S., 2d., 5p.	775	2889
			Sedan, 6p.	995	3175	Stat. Wag.	850		40-52			Conv. Cou., 3-6p.	1045	3240	Tour.S., 4d., 5p.	805	2924
Century 40-60			Sedan, 8p.	1235					Tour. Sedan, 5p.	1440	3900				Sedan, 7p.	1005	3359
Tou.Sed., 4d., 5p.	1211	3935	Limousine, 8p.	1310		De Luxe			Coupe, 2p.	1380	3810	Cust. 8 Cruiser			Sedan Limo., 7p.	1080	
Conv. Cou., 2d., 5p.	1343	3915			V8-85	Bus. Coupe	720	2831				Club Cou., 3-6p.	1069	3440	Stat. Wag., 8p.	970	3144
C. Phae., 4d., 5p.	1620	4140			Coupe	700	2791					Tour.Sed., 4d., 6p.	1131	3555			
			<b>Windsor Six</b>			Tudor Sedan	740	2964	<b>LINCOLN</b>								
Roadmaster			Coupe, 5p.	935		Fordor Sedan	785	2966	V-12-136 in.			<b>PACKARD</b>					
40-70			Conv. Coupe, 5p.	995		Conv. Club Cou.	825	2956	Sedan, 5p., 2w.			One Ten,			De Luxe Six		
Sport Cou., 2d., 6p.	1277	3990	Sedan, 6p.	1025	3210	Stat. Wag.	920	3282	Conv. Road.Leb.			Model 1800			40-26		
Tou.Sed., 4d., 6p.	1359	4045	Limousine, 8p.	1350					Coupe, LeB.			Bus. Coupe	867	3110	Bus. Coupe, 3p.	835	3105
Limited 40-80									Wilby. Conv. Vict.			Club Coupe	934	3150	Tour. S., 2d., 6p.	881	3165
Tou.Sed., 4d., 6p.	1553	4400							Wilby. Coupe, 5p.			Conv. Coupe	1099	3230	Tour. S., 4d., 6p.	932	3200
For. Sed., 4d., 6p.	1727	4455							V-12-145 in.			Tour. Sedan, 2d.	959	3190	Sport Coupe, 6p.	876	3105
C. Phae., 4d., 6p.	1952	4540							Sedan, 7p.			Tour. Sedan, 4d.	990	3200	Cabriolet, 6p.	1003	3195
			<b>Traveler-Eight</b>			<b>GRAHAM</b>			Limousine, 7p.			Station Wagon	1195	3380			
Limited 40-90			Coupe, 3p.	1095	3475	De L. Special			Conv.Sed.Leb.						De Luxe Eight		
Tou.Sed., 4d., 6p.	1942	4590	Coupe, 5p.	1150	3525	Comb. C., 5p., 2d.	995		Jud. Berline, 2w.			One Twenty,			40-28		
Tou.Sed., 4d., 8p.	2096	4645	Vict. Sedan	1150		Sedan, 2d., 5p.	965		Wilby. Berline, 3w.			Model 1801			Bus. Coupe	875	3180
Limo., 4d., 8p.	2199	4705	Sedan	1180	3590	Sedan, 4d., 5p.	995		Wilby. Limo.			Bus. Coupe	1038	3350	Tour. S., 2d., 6p.	919	3250
			<b>New Yorker</b>						Jud. Sed. Limo.			Club Coupe	1105	3405	Tour. S., 4d., 6p.	970	3295
<b>CADILLAC</b>			Eight			Custom Spec.			Brunn Cabriolet			Conv. Coupe	1270	3485	Cabriolet	1046	3290
Series 40-60S			Coupe, 3p.	1175		Comb. Cou., 5p.	1130		Brunn Cabriolet			Conv. Sedan	1565	3640	Sport Coupe, 6p.	913	3195
Tour.Sed., 5p., 4d.	2090	4110	Coupe, 5p.	1230		Sedan, 2d., 5p.	1100		Brunn Cabriolet			Tour. Sedan, 2d.	1130	3440			
Tou.Sed., Div., 5p.	2230	4070	Conv. Coupe, 5p.	1375		Sedan, 4d., 5p.	1130		Wilby. Spt.Sed.5p			Tour. Sedan, 4d.	1161	3450	Torpedo		
			Vict. Sedan, 6p.	1230					Brunn Tour.Cab.			Club Sedan, 4d.	1234	3460	Eight		
Series 40-82			Sedan, 6p.	1260	3635	De Luxe						Station Wagon	1397	3580	40-29		
Tour.Sed., 5p., 4d.	1745	4030				Supercharger			<b>LINCOLN-ZEPHYR</b>			Conv. Vict.Dar.	3800	3826	Sport Coupe	1016	3390
Coupe, 2p.	1685	3940	<b>Saratoga</b>			Comb. Cou., 5p.	1130		Standard	1360	3520				Tour. S., 4d., 6p.	1072	3480
			Eight			Sedan, 2d., 5p.	1100		Coupe	1400	3600	One Twenty			<b>STUDEBAKER</b>		
Series 40-72			Sedan, 6p.	1375		Sedan, 4d., 5p.	1130		Club Coupe	1770	3790	De Luxe			Model 1801		
Tour.Sed., 5p., 4d.	2670	4670							Conv. Coupe	1400	3600	Coupe, Club	1155	3400	Model 1801		
Tour. Sed. Div.	2740		<b>Crown Imp.</b>			Custom			Sedan, 4d.	1400	3620	Coupe, Conv.	1311	3470	Coupe, Club	1155	3400
Tour. Sedan, 7p.	2785	4700	Sedan, 6p.	2245		Supercharger			Town Limousine	1740	3670	Sedan, Club, 4d.	1307	3480	Coupe, 3p.	660	2290
Tou.Imp.Sed., 7p.	2915	4740	Limousine	2445		Comb. Cou., 5p.	1265		Cont. Cabriolet	2800	3900	Sedan, Tour., 4d.	1240	3495	Coupe, 2-4p.	695	2335
Bus.Tou.Sed., 7p.	2690	4700				Sedan, 2d., 5p.	1235								Club Sedan, 2d.	700	2360
Bus.Tou.Imp., 7p.	2825	4740				Sedan, 4d., 5p.	1265		<b>MERCURY</b>						Cruising S., 4d.	740	2390
			<b>CROSLLEY</b>						Twn.Sed., 4d., 6p.	960	3103	Super Eight,					
Series 40-75			Conv. Coupe, 2p.	337	900	<b>HUDSON</b>			Sedan, 2d., 6p.	920	3068	One Sixty,			<b>De Luxe</b>		
Tou.Sed.Div., 5p.	2995	4900	Conv. Sedan, 4p.	362	933	Travel Six-40			Sedan, 4d., 6p.	960	3030	Model 1803			Coupe, 3p.	705	2315
Tour. Sedan, 7p.	3155	4940	Delivery		975	Coupe, 3p.	709	2800				Club Coupe	1605	3735	Coupe, 2-4p.	740	2360
Tou.Im.Sed., 7p.	3210	4930	Station Wagon		1880	Sedan, 2d., 6p.	735	2895	<b>NASH</b>			Conv. Sedan	1647	3780	Coupe, 2d.	745	2385
Coupe, 2p.	3360	4970				Vict. Coupe, 4p.	750	2830	Nash-LaFay.				2065	3990	Club Sedan, 2d.	785	2415
Coupe, 5p.	3380	4810				Sedan, 4d., 6p.	763	2940	Bus. Coupe	795	3190	Model 1804					
Town Sedan, 5p.	3635	4935							Sedan, 2d.	845	3235	Tour. Sedan, 4d.	1910	4070	Commander		
Formal Sed., 5p.	3995	4900				De L. Six-40			Conv. Sedan	850	3190	Model 1805			Six		
Formal Sed., 7p.	3995	4970				Coupe, 2p.	745	2840				Tour. Limousine	2169	4460	Coupe, 3p.	895	3055
Conv. Coupe, 2p.	3380	4915				Sedan, 2d., 6p.	775	2930				Custom Super	2041	4350	Club S., 2d., 6p.	925	3155
Conv. Sedan, 5p.	3945	5110				Sedan, 4d., 6p.	791	2865				Eight			Sedan, 4d., 6p.	965	3180
Town Car	5115	5195				Conv. Coupe, 5p.	806	2965				Model 1806			President		
			<b>DE SOTO</b>			Conv.Sed., 2d., 6p.	930	2860				Club Sedan	2243	3900	Eight		
Series 40-90			De Luxe				955	2920				Conv. Vict.	4570	4121	Coupe, 3p.	1025	3280
Tou.Sed., 5p., 4d.	5140	5190	Bus. Coupe, 3p.	845	3001										Club S., 2d., 6p.	1055	3370
Tou.Sed.Div., 5p.	5215		Coupe, 2-4p.	905	3026										Sedan, 4d., 6p.	1095	3420
Tour. Sedan, 7p.	5270	5215	Tou.Sed., 2d., 5p.	905	3066												
Tou.Imp.Sed., 7p.	5420	5260	Tou.Sed., 4d., 5p.	945	3086												
Coupe, 2p.	5340		Tou.Sed., 4d., 7p.	1175	3490												
Coupe, 5p.	5440																
Town Sedan, 5p.	5695		Custom														
Formal Sed., 5p.	6055		Coupe, 2p.	885	3024												
Formal Sed., 7p.	6055	5260	Coupe, 2-4p.	945	3044												
Conv. Coupe, 2p.	5440		Conv. Coupe, 4p.	1095	3329												
Conv. Sedan, 5p.	6000		Tou.Sed., 2d., 5p.	9													



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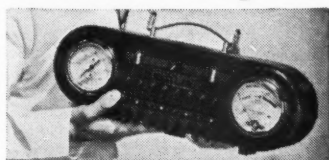
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#### New Westinghouse Auxiliary Lamps

All-glass driving and passing lamps  
similar in construction to the now fa-  
miliar all-glass Sealed Beam auto  
headlamp have been made available to  
manufacturers of housing and mount-  
ing equipment designed for their use,  
engineers for the Westinghouse Lamp  
Division, Westinghouse Electric &  
Manufacturing Co., have announced.  
List price of the new units has been  
set at \$1.10. Equipment manufactur-  
ers are expected to announce complete  
units soon.

Approximately 2 in. smaller in di-  
ameter than the standard Sealed  
Beam headlamps, the new units are  
designed to supplement rather than  
replace present lighting equipment on  
pre-1940 cars whose wiring systems  
are inadequate to handle the addi-  
tional wattage required by the Sealed  
Beam System. Connected to upper  
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simulate the Sealed Beam's "country  
beam." Connected to lower beam cir-  
cuits, the passing lamp will simulate  
the "traffic beam." Both have single  
30-watt filaments.

The new lamps will enable drivers  
of cars not equipped with Sealed  
Beam lighting to enjoy lighting which  
compares favorably with that pro-  
vided by the new system. Aside from  
providing needed additional light, ma-  
jor advantage of the new lamps is the  
fact that air and moisture cannot pen-  
etrate the sealed units and impair the  
efficiency of reflecting surfaces. Like  
the standard Sealed Beam headlamps,  
the new lamps comprise lens, reflector  
and light source in a single sealed and  
permanently focused unit.

Plans for their manufacture were  
first announced last December. Since  
that time those plans have been com-  
pleted and the lamps are now in pro-  
duction for delivery to housing and  
mounting equipment makers.

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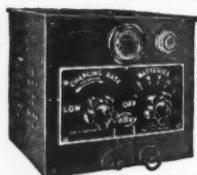
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## Indianapolis

(Continued from page 15)

in which he almost won last year's Indianapolis race. For this year's race Louie has assigned Rex Mays to drive the car, making it a "HOT" combination of car and driver. It will be remembered that Louie's car was the fastest job in last year's race, and Rex Mays is the young feller who likes 'em that way. Furthermore, he drives them with the greatest of ease.

Another hot combination that will bear watching in this year's race will be the Sampson Motors, Inc., entry. The same 16-cylinder car in which Bob Swanson, the Pacific Coast midget champion, startled all the rail-birds during his qualifying trials last year by getting up into the 130-mile an hour class. This job is powered with the same engine which Frank Lockhart used in his Stutz-Blackhawk Daytona Beach straight-away car. A twin-engine combination of two Miller 91½ cu. in. engines making it a total of 183 cu. in. with two Miller-type centrifugal super-chargers.

While visiting with Alden "Sam" Sampson, owner of this car, and Riley Brett, its engineer, the writer learned that it was forced out of last year's Indianapolis race due to improper manifolding, and a vibration caused by a whipping driveshaft at high speed. They now have both of these conditions eliminated, making the driveshaft much shorter, giving it a better bearing support, and all the manifold restrictions have been eliminated. The only other changes being the increased capacity of both the gasoline and oil tanks, they will now carry 50 gal. of gas and 11 gal. of oil.

The car is now completed and arrived at the Indianapolis track early in May. The entire Sampson group seem very optimistic with their expectations in the coming race, and feel confident the car will establish a new track record during the qualification trials with Bob Swanson again at the helm.

In addition to getting their Indianapolis car all set for this year's race, Sampson Motors, Inc., have been manufacturing midget cars in their Los Angeles factory equipped with a four-cylinder engine which develops 100 hp. at 6500 r.p.m., overhead camshafts with four valves per cylinder. Bore 3½ in. Stroke 3¼ in. and a piston displacement of 99.7 cu. in. The engine complete weighs only 200 lb. and gives great promise as being one of the leading midget car engines in this country.

(Continued on page 78)

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## Trouble Shooting On Regulators

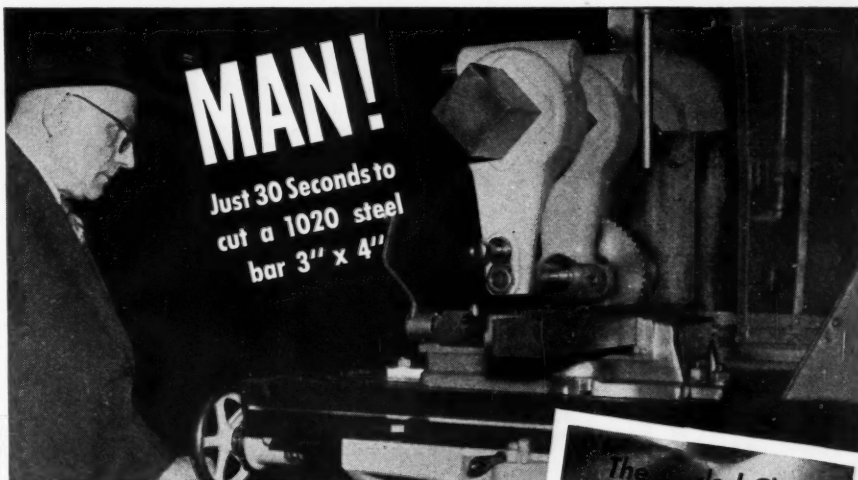
(Continued from page 21)

cause of a break in the circuit, the output is not being carried to the battery. Inspection will disclose these conditions.

(2) WITH A FULLY CHARGED BATTERY AND A HIGH CHARGING RATE, connect test ammeter into the circuit at the "BAT" terminal, operate the engine at a medium speed and note output. Then disconnect the "F" terminal lead from the regulator (see Figure 2). This opens the generator field circuit and, if the generator is in normal condition, the output will drop off to a low value. If the output remains high, the generator field circuit is grounded, either in the wiring harness or in the generator itself. Disconnect the lead at the "F" terminal of the generator. If the output still continues high, the field circuit is definitely known to be grounded within the generator, and the generator should be removed from the engine for a bench check.

(A) If the output drops off to zero with the "F" terminal lead disconnected, the condition causing the continued high output has been definitely isolated in the regulator. Reconnect the "F" terminal lead to the regulator, remove the regulator cover and push the armature of the voltage regulator down to open the voltage regulator points. The output should normally drop off. If it does not, check the generator field circuit (contact points and voltage regulator outer winding) within the regulator, with particular attention to the bushings and insulators under the contact point supports of the two regulator units. (Figure 3.)

(B) If separating the voltage regulator contact points by hand does cause the output to drop off to a low value, then the voltage regulator is out of adjustment and it should be checked and readjusted. However, it must be remembered that the voltage regulator functions on battery voltage, and the charging rate at any particular voltage for which the regulator may be set, depends as much on battery temperature as on battery specific gravity. Thus, if the voltage is held to a certain definite value and the battery charged at this value, the charging current will taper down as the battery specific gravity comes up, so long as abnormal temperatures are not experienced. But if the battery tempera-



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ture is abnormally high due to the car operating in a hot climate, the charging rate may remain fairly high, even though the battery specific gravity does come up to a value indicating a charged condition.

This must be kept in mind in checking a complaint of this nature. If the car operates in a hot climate where freezing weather is not experienced, it will be satisfactory to set the voltage regulator to operate at 6.8 to 7.0 volts at operating temperature instead of the 7.2 to 7.4 voltage setting. When this readjustment is made on the voltage regulator unit, the cut-out relay closing voltage must also be lowered, and reset to close at 6.2 to 6.6 volts.

It sometimes happens that the service man hears the complaint that the generator is not charging and, upon checking the battery, finds it fully charged. The answer is, of course,

that the voltage regulator has operated normally to reduce the generator output as the battery comes up to charge and thus prevent battery overcharge. By operating the cranking motor for about 15 sec. with the ignition switch off or the high tension coil lead disconnected, you can demonstrate that the generator is able to produce an output, since in normal operation the regulator will permit the output to increase and remain at a comparatively high value until the current used in cranking has been replaced in the battery.

By keeping these simple checks in mind, the service man can intelligently approach a case of reported trouble and quickly determine what, if anything, is wrong and furthermore, will be able to pick up the correct instruments and tools discussed previously on these pages and correct the condition causing the trouble.

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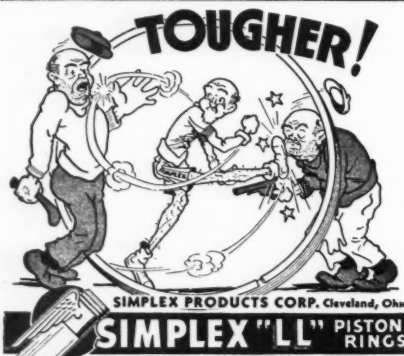
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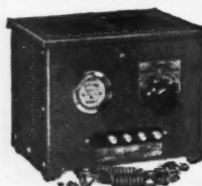
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## Indianapolis

(Continued from page 76)

At the Offenhauser engineering headquarters in Los Angeles, the night oil has been burning constantly as it generally does about this time of the year. Fred Offenhauser busy as ever keeping the boys in line with promises when the various engines and parts will be finished. Trying to keep them all happy. The racing boys would really be lost without the help of reliable Fred Offenhauser. His biggest job lately has been making new crankshafts for most of this year's Indianapolis cars, plus his usual production of Offenhauser midget engines.

A résumé of the Boyle racing headquarters activities can be given in a very brief manner, according to Harry "Cotton" Henning, president and general manager, head mechanic and chief tester de l'équippe. He reports: same names, same drivers, same cars as last year unless some unforeseen changes might take place prior to race day as anything might happen in this racket at any time, says Cotton.

Therefore, Wilbur Shaw, last year's winner will again be at the wheel of his winning Maserati; Ted Horn driving the 268 cu. in. front-drive job which the late Bill Cummings used to drive, and Chet Miller driving the same 255 cu. in. front-drive which he wrecked in last year's race during the Floyd Robert mishap. Thus completing the Boyle racing headquarters team, of which the writer's onetime mechanic and pal, Cotton Henning, will be in full charge.

Two of the four-wheel-drive cars which were entered in last year's race by Harry Miller from Pittsburgh, will again make their bid at Indianapolis this year with James Drake, Jr., and Eddie Offutt in charge. The entrant for this team of cars has not been named to date. George Barringer, who hails from Wichita Falls, Tex., has been named to drive one of the cars, and the driver for the other car has not yet been decided.

In summary to the outlook of this year's Indianapolis 500-mile race, with little or no change in the set-up of last year's cars, and not any new cars making their appearance on the starting line, the prediction of racing critics is that obviously victory will be decided by one of our select group of five drivers, Shaw, Mays, Horn, Swanson and Petillo. Unless we are successful in getting some of the foreigners over here which might change the entire picture. And even then, the writer will place his odds on our boys, as they have worked the so-called "bugs" out of their cars, and they all have the ability to "poosh-em-up" into victory.

Expecting to see you at Indianapolis, May 30th!!

## Diminutive Bearings

Norma-Hoffmann Bearings Corp., Stamford, Conn., has announced that its line of diminutive bearings which have heretofore been available in the full or retainerless type, can now be obtained as standard with retainers (or ball cages). These bearings are made in bore sizes of 1/8 in., 3/16 in. and 1/4 in.



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